

SPECIFICATIONS FOR
Penns Grove – Carneys Point Regional School District
100 Iona Avenue
Penns Grove, New Jersey 08069

**Paul W. Carleton Elementary School
2025 Pre-K Classroom Addition**

251 East Maple Avenue
Penns Grove, NJ 08069

Architect:

Garrison Architects
713 Creek Road
Bellmawr, NJ 08031
(856) 396-6200

Construction Manager:

GREYHAWK
2000 Midlantic Drive Suite 210
Mount Laurel, New Jersey 08054
(856) 722-1800

Site Engineer:

Environmental Resolutions, Inc.
815 East Gate Drive, Suite 103
Mount Laurel, NJ 08054
(856) 235-7170

Structural Engineer:

Orndorf and Associates
8600 West Chester Pike, Suite 201
Upper Darby, PA 19082
(610) 896-4500

Mechanical, Electrical &

Plumbing Engineer:

Mulhern Consulting Engineers
321 South York Road
Hatboro, PA 19040
(215) 293-9900

ISSUED FOR BID: November 11, 2024
GA# 23-42

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BIDDER'S CHECKLIST

BIDDERS SHALL SUBMIT THE FOLLOWING FORMS WITH THE BID

- Bidder's Checklist (This Form) – Please include this form in the bid submission with each item included in the bid submission checked off within the square for that item. Please note that the first two lists are the requirements for the Bidder.

**FAILURE TO SUBMIT THE FOLLOWING FORMS WITH THE BID SHALL BE CAUSE FOR
AUTOMATIC REJECTION OF THE BID**

- Bid Form (All blank spaces are required to be filled out)
- Acknowledgment of Receipt of Addenda / Clarifications. If no Addenda / Clarifications are issued, form shall still be submitted, with the applicable box checked on the form
- Statement of Ownership
- Bid Bond
- Consent of Surety
- Total Amount of Uncompleted Contracts Affidavit (Form DPMC 701)
- No Material Adverse Change in Qualification

BIDDER'S CHECKLIST

**THE FOLLOWING FORMS ARE REQUESTED TO BE SUBMITTED WITH THE BID
AND MUST BE SUBMITTED PRIOR TO THE AWARD OF THE CONTRACT**

**FAILURE TO SUBMIT THE FOLLOWING FORMS PRIOR TO AWARD
SHALL BE CAUSE FOR AUTOMATIC REFUSAL TO AWARD AND
REJECTION OF THE BID**

- Notice of Classification issued by the State of New Jersey Department of the Treasury Division of Property Management and Construction
- C.271 Political Contribution Disclosure Form
- Hold Harmless Agreement
- Certification Regarding the Debarment, Suspension, Ineligibility and Voluntary Exclusion
- Certification of Non-Debarment for Federal Government Contracts
- Affirmative Action Requirements
- Non-Collusion Affidavit
- Equipment Certification in accordance with item 6c in the Instructions to Bidders
- Disclosure of Investment Activities in Iran
- Certification of Non-Involvement in Prohibited Activities in Russia or Belarus
- Public Works Contractor Registration Certificate
- Business Registration Certificate or Proof of Business Registration

BIDDER'S CHECKLIST

**BIDDER SHALL SUBMIT THE FOLLOWING FORMS WITH THE BID
IN RELATION TO SUBCONTRACTORS NAMED IN THE BID**

**FAILURE TO SUBMIT THE FOLLOWING FORMS WITH THE BID SHALL BE CAUSE FOR
AUTOMATIC REJECTION OF THE BID**

- A Total Amount of Uncompleted Contracts Affidavit (form DPMC 701)
-

**THE FOLLOWING FORMS ARE REQUESTED TO BE SUBMITTED WITH THE BID IN
RELATION TO EACH OF SUBCONTRACTORS NAMED IN THE BID
AND MUST BE SUBMITTED PRIOR TO THE AWARD OF THE CONTRACT**

**FAILURE TO SUBMIT THE FOLLOWING FORMS PRIOR TO AWARD
SHALL BE CAUSE FOR AUTOMATIC REFUSAL TO AWARD AND
REJECTION OF THE BID**

- DPMC Notice of Classification
- Trade License (if applicable)
- Business Registration Certificate
- Public Works Contractor Registration Certificate

NOTICE TO BIDDERS

Sealed bids will be received by the Penns Grove – Carneys Point Regional Board of Education at the Administration Building located at 100 Iona Avenue, Penns Grove, New Jersey 08069 until 3:00 P.M. local time on **Wednesday, December 11, 2024** and will be publicly opened and read immediately thereafter, at said place for **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition**.

It is expressly understood that the Bidder is responsible for getting the bid to the Business Administrator by the time and date set for the bid opening. Bids shall be addressed to the Owner whose name appears in Paragraph 1a of the Instructions to Bidders; they shall be mailed or delivered to the address stated herein, enclosed in an opaque sealed envelope, clearly marked with the name of the Bidder and the name of the Project and the Bid# as described in this Notice to Bidders; and must be received by not later than the time designated in this Notice to Bidders. No responsibility will attach to Architect or Owner for premature opening of a bid which is not properly identified. Any bid received after 3:00 PM will be returned unopened.

The Bidders shall submit, in accordance with N.J.S.A. 18A:18A-18(b)(2), one Lump Sum Bid for all the work and materials. Bidders must be pre-qualified by the New Jersey Department of Treasury, Division of Property Management and Construction (DPMC) with at least the DPMC classification associated with the work they intend to directly perform or, if Bidder will not directly perform any work, with DPMC classification C006, C008, or C009. Bidders' Prime Subcontractors, defined as those listed in N.J.S.A. 18A:18A-18, must be pre-qualified by DPMC with the DPMC classification associated with the work they intend to directly perform or subcontract. The Bidder and named Prime Subcontractors must be pre-qualified prior to the date that bids are received.

Electronic Copies of the Bid Documents may be obtained by contacting Garrison Architects via email at jminniti@garrisonarch.com. There is no charge for obtaining an electronic copy of the Bid Documents.

Bids must be accompanied by a certified check, bank cashier's check, treasurer's check or Bid Bond in the form provided in the Contract Documents, with corporate surety satisfactory to the Owner, in an amount of 10% of the Base Bid, but in no case in excess of \$20,000.00, pursuant to N.J.S.A. 18A:18A-24, naming as payee or obligee, as applicable, **Penns Grove – Carneys Point Regional Board of Education**, to be retained and applied by the undersigned as provided in the Contract Documents in case the successful Bidder defaults in executing the Agreement or furnishing the bonds and insurance certificates as required by the Contract Documents.

Prospective Bidders are advised that this Project is one which will be subject to and will be governed by provisions of New Jersey law, including, but not limited to, those regarding (a) Prequalification of Bidders (N.J.S.A. 18A:18A-26 et seq.); (b) Prevailing Wage Rates (N.J.S.A. 34:11-56.25 et seq.); (c) Use of Domestic Materials, (N.J.S.A. 18A:18A-20); and (d) Ownership Disclosure Certification, (N.J.S.A. 52:25-24.2).

NOTICE TO BIDDERS

The Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq., requires that the Bidder and named Prime Subcontractors must be registered at the time of Bid. The Owner is requesting that copies of the Public Works Contractor Registration Certificates for Bidder and its named Prime Subcontractors be included in the Bidder's Bid Package, but the Bidder must provide copies of the Certificates no later than the time of award. Pursuant to N.J.S.A. 52:32-44 all business organizations that do business with a local contracting agency, including Bidders and Named Prime Subcontractors, are required to be registered with the State through the New Jersey Department of Treasury, Division of Revenue. The Owner is requesting that copies of the Registrations for Bidder and its Named Prime Subcontractors be included in the Bidder's Bid Package, but the Bidder must provide proof of such Registrations prior to the award of the Contract. In addition, each Bid Package must include a certificate from a surety company stating it will provide said Bidder with a bond in such sum as required by N.J.S.A. 18A:18A-25.

No bid may be withdrawn for a period of sixty (60) days after the dates set for the opening thereof. The right is reserved to reject all bids pursuant to N.J.S.A. 18A:18A-22 or to waive minor informalities, defects, and non-material exceptions. Bidders are required to comply with the provisions of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27-1.1 et seq.

The Time Schedule for the project is as follows:

Monday	11/11/24	Bid packages available via Electronic Delivery
Thursday	11/14/24	Pre-Bid Meeting at 3:00 PM at the Penns Grove – Carneys Point Regional Board of Education at the Administration Building located at 100 Iona Avenue, Penns Grove, New Jersey 08069. Attendance at the Pre-Bid meeting is not mandatory, but strongly recommended.
Wednesday	11/27/24	Deadline for Questions to Garrison Architects (email questions to jminniti@garrisonarch.com)
Monday	12/02/24	Addendum Issued to the Plan Holders, if required
Wednesday	12/11/24	Bids Due at 3:00 P.M. in the Penns Grove – Carneys Point Regional Board of Education at the Administration Building located at 100 Iona Avenue, Penns Grove, New Jersey 08069.

By Order of the Penns Grove – Carneys Point Regional Board of Education Board of Education
Christopher DeStratis, Business Administrator /Board Secretary

INSTRUCTIONS TO BIDDERS

(The following instructions shall be adhered to in the preparation of this bid by the bidder.)

1. DEFINITIONS

- a. Owner: The term "Owner" as used in the Contract Documents refers to Penns Grove – Carneys Point Regional Board of Education, 100 Iona Avenue, Penns Grove, New Jersey 08069.
- b. Architect: The term "Architect" refers to Garrison Architects, 713 Creek Road, Bellmawr, New Jersey 08031, (856) 396-6200, Fax (856) 396-6205.
- c. Construction Manager: The term "Construction Manager" refers to TBD.
- d. Site Engineer: The term "Site Engineer" refers to Environmental Resolutions, Inc., 815 East Gate Drive, Suite 103, Mount Laurel, New Jersey 08054, (856) 235-7170.
- e. Contractor: The term "Contractor" refers to the bidder to whom an award is made to perform the work under the Contract enumerated in the Notice to Bidders.
- f. School Facilities Project: This is the construction project which is the subject of this specification.
- g. The Contract Documents include: all items listed in the Index to the Specifications, including forms submitted by the awardee; all Addenda / Clarifications; all Drawings made available prior to the submission of bids; all Specifications made available prior to the submission of bids; all Schedules made available prior to the submission of bids; and the A101 and A201 to be entered by the Owner and the awardee and all documents attached thereto and incorporated therein.
- h. Prime Subcontractor: The term "Prime Subcontractor" means a subcontractor performing work in any of the branches of work listed in N.J.S.A. 18A:18A-18(a) and all work kindred thereto.

2. PREPARATION OF BIDS

- a. Bids shall be submitted on the Bid Form. All blank spaces of the form shall be fully completed in accordance with these instructions, without variation, and there shall be no interlineations, deletions or additions. Base Bid Sum shall include all defined allowances and shall be stated both in writing and in figures; and, in case of discrepancy, written words shall be considered as being the Base Bid Sum.

Submit the full bid package in duplicate (1 original and 1 copy).

- b. Bids shall not contain recapitulations of the work to be done. No oral, telegraphic or telephonic communications or modifications shall be considered.
- c. Bids shall be addressed to the Owner whose name appears in Paragraph 1a of the Instructions to Bidders; it shall be mailed or delivered to the address stated in the Notice to Bidders, enclosed in an opaque sealed envelope, marked with the name and number of the Project and bidder as described in the Notice to Bidders; and must be received by not

INSTRUCTIONS TO BIDDERS

later than the time designated in the Notice to Bidders. No responsibility will attach to Architect or Owner for premature opening of a bid which is not properly identified.

- d. Bidders shall submit all documents listed on the Bidder's Checklist.
- e. The failure to include a document with a bid shall not be considered a defect where the Bidder's Checklist "requests", rather than requires, that the document be submitted with the bid. However, the failure to submit such document prior to award shall be cause for the Owner's refusal to award and for rejection of the bid.

3. DISCREPANCIES OR OMISSIONS: BIDDER'S RESPONSIBILITY

- a. Bidders who find discrepancies in or omissions from the Contract Documents or are in doubt as to their meaning should at once notify the Architect in writing no later than the Deadline for Questions set forth in the "Notice to Bidders". If it is deemed necessary, instructions in the form of Addenda / Clarifications to Specifications and / or Drawings will be issued to all bidders in a manner consistent with N.J.S.A. 18A:18A-21(c) on the date set forth in the "Notice to Bidders". Owner or Architect will not be responsible for any oral instructions. **It will be assumed with the submission of the bid that the bidder has fully examined the site and the Contract Documents and has made provisions for construction under the applicable conditions; Bidder is responsible for seeing that his Prime Subcontractors are similarly familiar with the site and requirements of the Contract Documents so far as applicable to their work.**
- b. Bids shall be based upon the Contract Documents and may not be withdrawn for a period of 60 days after the date set for receiving bids. Any bid which has been opened by the Owner may not be withdrawn during the period specified herein except as specifically permitted by law.

4. BID SECURITY: FORFEITURE

- a. Bids shall be accompanied by a bid guarantee in the form of a Bid Bond issued by a Surety licensed in the State of New Jersey, cashier's check or a certified check issued by a national bank or trust company and payable to the order of the Owner in the amount of ten (10%) percent of the Bid or \$20,000, whichever is less, pursuant to N.J.S.A. 18A:18A-24, to be retained and applied as provided, in case the bidder should default in executing the Agreement, or furnishing the required insurance certificates within ten (10) days after notice that an award has been made to it, or furnishing the required Performance and Payment Bond as required by the Contract Documents.
- b. Bid securities of the three lowest responsible bidders will be retained until Contract Documents have been properly executed by the bidder to whom the contract is awarded but in no event exceeding 60 days after bid opening unless consent of the bidders and, if applicable, their sureties is obtained for such longer period as may be agreed. In the event that a Bid Bond is submitted with the bid, the bidder shall make certain that a proper power of attorney evidencing the authority of the agent of the surety to execute the Bid Bond is furnished therewith.
- c. Bidders who intend to submit a Bid Bond as the required security with their bids must use the form of Bid Bond provided or its legal equivalent. Such bidders must also provide a

INSTRUCTIONS TO BIDDERS

Power of Attorney for the Attorney-In-Fact who issued the Bond, which document must be currently dated and valid for the entire amount of the Bond.

5. CONSENT OF SURETY

Pursuant to N.J.S.A. 18A:18A-25, bids shall be accompanied by a Consent of Surety assuring that satisfactory arrangements have been made between the Surety and the bidder, by which the Surety agrees to furnish the bidder with a Performance and Payment Bond and a Maintenance Bond, each in the stated amount of one hundred percent of the Contract amount. The Consent of Surety shall be executed by an approved Surety Company authorized to do business in the State of New Jersey. The Surety's consent and guarantee to issue the Performance Bond, Payment Bond, and Maintenance Bond must be unconditional. **Submission of a Consent of Surety which contains any prior conditions upon the Surety's issuance of the required Bonds shall be cause for rejection of the Bid.**

6. AWARD OF CONTRACT

- a. The Owner reserves the right to waive minor informalities or non-material exceptions in the bid or bidding process, in accordance with applicable law. Bids may be rejected if they show any omissions, alterations of form, additions or deductions not called for, conditional or uninvited alternate bids, or irregularities of any kind. Bids in which the prices are unbalanced may be rejected. Claims on account of mistakes in or omissions in bids will not be considered, except as specifically permitted by law. The submission of a bid vests no contractual, property, or other right in favor of the bidder.
- b. The Owner reserves the right to reject all bids pursuant to the Public Schools Contracts Laws. The Owner reserves the right to disqualify a bidder with whom the Owner, and/or any other school district in the State of New Jersey and/or the New Jersey Economic Development Authority or successor State Agency, had prior negative experience(s) as defined and in accordance with N.J.S.A. 18A:18A-4.
- c. Before awarding a Contract, the Owner may require the apparent low bidder for the Contract to provide proof that the bidder possesses the necessary equipment that will be required to complete this project in accordance with N.J.S.A. 18A:18A-23.
- d. The award of Contract or rejection of bids will be made within sixty (60) days of the Bid Opening, except that the bids of any bidders who consent thereto in writing may, at the request of the Owner, be held for consideration for such longer period as may be agreed.
- e. If awards are made, the Owner and Contractor will execute the Agreement within twenty-one (21) days after the date of the award, Sundays and holidays excepted. This time may be extended by agreement of the Owner and the awardee.
- f. The A101, A201, Performance and Payment Bond, and Maintenance Bond forms included with these Specifications exemplify the type of Contract forms that the successful bidder will be required to execute before or after award has been made, in accordance with the Contract Documents and State law governing such Bonds.
- g. Change orders under the Contract are subject to N.J.A.C. 5:30-11 and the availability of funds per N.J.A.C. 6A:23A-21.1.

INSTRUCTIONS TO BIDDERS

7. CHANGES PRIOR TO OPENING OF BIDS

- a. During the period allowed for the preparation of bids, the Architect may furnish the prospective bidders Addenda / Clarifications setting forth additions to or alterations of the Contract Documents, which additions or alterations shall be included by each bidder in the computation of amounts to be inserted by it in the bid which it submits, and which Addenda / Clarifications shall become a part of such Contract Documents as if the same were fully incorporated herein.
- b. It shall be the duty of each prospective bidder to inform its prospective Subcontractors of such Addenda / Clarifications to the extent that they may be affected.
- c. Any Addenda / Clarifications issued by the Architect will be sent in a manner consistent with N.J.S.A. 18A:18A-21(c) to each prospective bidder of whom the Architect shall have a record.

8. START OF WORK

Shop Drawings, Submittals, etc. can be commenced after Notice to Proceed has been given by Owner or Architect.

9. COMPLETION OF THE PROJECT

The project must be completed by the date set forth in the Specification Section 01010- Summary of Work. In accordance with N.J.S.A. 18A:18A-19, the Owner may deduct, from the contract price, any wages paid by the Owner to any inspector or inspectors necessarily employed by it on the work, for any number of days in excess of the completion date.

10. BONDS AND INSURANCE

Requirements for Bonds and Insurance are stated in these Instructions to Bidders, Specifications and the A201. A Performance and Payment Bond is required in the amount of 100% of the Contract price for each Bond. A Two (2) year Maintenance Bond is required in the amount of 100% of the Contract.

The Performance and Payment Bond need not be submitted with the bidder's bid but must be submitted at the time of execution of the Contract. The Performance and Payment Bond shall be in compliance with requirements of the New Jersey Public Schools Contracts Law and Public Works Bond Act, specifically N.J.S.A. 18A:18A-25 and N.J.S.A. 2A:44-143 et seq. The Maintenance Bond shall be in the form provided herewith and shall be provided to Owner as required in the A201.

INSTRUCTIONS TO BIDDERS

11. STATEMENT OF BIDDER'S QUALIFICATIONS

In accordance with N.J.S.A. 18A:18A-26 et seq. each bidder shall submit the following documents for itself (and, as to (1) and (2), for each of its named Prime Subcontractors) from the State of New Jersey's Department of the Treasury, Division of Property Management and Construction:

- (1) A NOTICE OF CLASSIFICATION indicating that they are qualified to bid on the public work as specified herein. Bidders must be pre-qualified by the New Jersey Department of Treasury, Division of Property Management and Construction (DPMC) with at least the DPMC classification associated with the work they intend to directly perform or, if Bidder will not directly perform any work, with DPMC classification C006, C008, or (if the project does not call for construction of a new facility) C009. Bidders' Prime Subcontractors must be pre-qualified by DPMC with the DPMC classification associated with the work they intend to directly perform or subcontract. Notwithstanding anything else in this bid document package, Bidders need not name subcontractors furnishing general construction work under N.J.S.A. 18A:18A-18(a)(5). The bidder and/or named Prime Subcontractors must be pre-qualified by the New Jersey Department of Treasury, Division of Property Management and Construction, prior to the date that bids are received. These documents are requested to be provided with the bid, but in any event shall be submitted prior to the contract award. The classification status of bidders and named Prime Subcontractors will be independently verified through DPMC after the bid opening, prior to award.
- (2) TOTAL AMOUNT OF UNCOMPLETED CONTRACTS affidavits (Form DPMC 701) duly signed and notarized with the corporate seals affixed. These documents must be submitted with the bid.
- (3) Bidder Affidavit of no material adverse change in qualification information since the latest statement in accordance with N.J.S.A. 18A:18A-32. This document must be submitted with the bid.

12. NEW JERSEY PREVAILING WAGE RATE / PUBLIC WORKS CONTRACTOR REGISTRATION

Bidders are required to comply with the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq. (the "Wage Act"), as amended.

Contractor shall ensure that all workers employed in the performance of this Contract shall be paid not less than the Prevailing Wage Rate designated for this locality by the Commission of Labor and Workforce Development. If it is found that any worker employed by the Contractor or any Subcontractor has been paid less than the Prevailing Wage Rate or otherwise violates the Wage Act, the Owner may terminate the Contractor's or Subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and its sureties shall be liable for any excess costs occasioned thereby to the Owner.

Pursuant to N.J.S.A. 34:11-56.27a, if the lowest responsive bidder submits a bid that is ten percent (10%) or more below than the next lowest bid, the lowest responsive bidder shall certify to the Owner that the prevailing wage rates required by the Wage Act shall be paid. If the bidder does not provide the certification prior to award of the contract, the bidder shall not be entitled to the award and its bid will be rejected.

INSTRUCTIONS TO BIDDERS

The Contractors can reference the State of New Jersey Department of Labor and Workforce Development Website <https://www.nj.gov/labor/wagehour/wagerate/CurrentWageRates.html> to view current Prevailing Wage Rates. The official wage rates will be included in the contract by the Board.

The Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq. (the “Registration Act”) requires that Contractors and named Prime Subcontractors must be registered pursuant to the Registration Act prior to submitting a bid. The Owner requests bidder provide a copy of the Public Works Contractor Registration Certificate for itself and any named Prime Subcontractors at the time of submission of the bid, but bidder must provide the Public Works Contractor Registration Certificate for itself and any named Prime Subcontractors prior to award. The Contractor shall enter into subcontracts only with subcontractors, whether Prime Subcontractors or otherwise, who are registered pursuant to the Act.

13. CERTIFIED PAYROLL REQUIREMENTS

Governor Murphy signed into law S-1442/A-5345, now P.L. 2023, c. 138, which requires public works contractor registration and payroll certification for public works projects to be completed online at <https://njwages.nj.gov/>. The Contractor will be required to submit the certified payroll via the Hub and via hard copy to Penns Grove - Carneys Point Regional Board of Education for itself and its subcontractors.

14. BUSINESS REGISTRATION AND USE TAX

Pursuant to N.J.S.A. 52:32-44, the Owner is prohibited from entering into a contract with a bidder unless the bidder and each named Prime Subcontractor has a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury. The Owner is requesting that copies of the Registrations for bidders and their named Prime Subcontractors be included with the bid, but the bidder must provide proof of such Registrations prior to the award.

Additionally:

- (1) The contractor shall not enter a contract with a subcontractor, whether a Prime Subcontractor or otherwise, for this project unless the subcontractor first provides the contractor with a valid proof of business registration.
- (2) After award, and prior to commencing work on site, the Contractor shall maintain and submit to the Owner a list of subcontractors and their addresses, which must be updated as provided information is no longer current.
- (3) The contractor and any subcontractor providing goods or performing services for this project, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered into the State. Any questions in this regard can be directed to the Division of Taxation at (609)292-6400. Form NJ-REG can be filed online at <http://www.state.nj.us/treasury/revenue/busregcert.shtml>.

Before final payment is made under the contract, the contractor shall submit to the Owner a complete and accurate final list of all subcontractors used and their addresses.

INSTRUCTIONS TO BIDDERS

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration as required, or that provides false business registration information, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000, for each proof of business registration not properly provided under a contract with a contracting agency.

15. OWNERSHIP DISCLOSURE CERTIFICATION

Pursuant to N.J.S.A. 52:25-24.2, no corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or proposal, or accompanying the bid or proposal of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own ten percent (10%) or more of its stock, of any class, or of all individual partners in the partnership who own a ten percent (10%) or greater interest therein, or of all members in the limited liability company who own a ten percent (10%) or greater interest therein, as the case may be.

If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding ten percent (10%) or more of that corporation's stock, or the individual partners owning ten percent (10%) or greater interest in that partnership, or the members owning ten percent (10%) or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until the names and addresses of every non-corporate stockholder, and individual partner, and member, exceeding the ten percent (10%) ownership criteria established in this act, has been listed.

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a ten percent (10%) or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a ten percent (10%) or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest.

The Ownership Disclosure Certification form shall be completed, signed, notarized, and submitted with the bid.

INSTRUCTIONS TO BIDDERS

16. N.J.S.A. 10:5-31, et seq. AFFIRMATIVE ACTION

Pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented, the following Affirmative Action requirements on the Project will be a condition of the Contract: The bidder, its subconsultants and subcontractors shall comply with the anti-discrimination provisions of N.J.S.A. 10:2-1 et seq., the New Jersey Law Against Discrimination, N.J.S.A. 10:5-1 et seq., N.J.A.C. 17:27-1.1 et seq. and shall guarantee to afford equal opportunity in performance of this Agreement in accordance with an affirmative action program approved by the State Treasurer.

17. N.J.S.A. 10:2-1. Anti-discrimination Provisions

Every contract for or on behalf of the State or any county or municipality or other political subdivision of the State, or any agency of or authority created by any of the foregoing, for the construction, alteration or repair of any public building or public work or for the acquisition of materials, equipment, supplies or services shall contain provisions by which the contractor agrees that:

- a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;
- b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;
- c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of \$ 50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
- d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

No provision in this section shall be construed to prevent a board of education from designating that a contract, subcontract or other means of procurement of goods, services, equipment or construction shall be awarded to a small business enterprise, minority business enterprise or a women's business enterprise pursuant to 18A:18A-51 et seq.

18. DOMESTIC MATERIALS/BUY AMERICAN

Pursuant to N.J.S.A. 18A:18A-20, Contractor shall use only manufactured and farm products of the United States, wherever available.

INSTRUCTIONS TO BIDDERS

19. SUBSTITUTION REQUESTS

Please refer to Specification Section 01300, "Submittals." "Or Equal" substitutions are permitted so long as they are equal to or superior to the basis of design and the Contractor takes full responsibility for all coordination and costs associated with collateral issues related to the substitution. No Substitutions will be reviewed during the bidding process. The Contractor takes full responsibility for all substitutions. Substitution submittals shall be made **no later than 30 days after Notice to Proceed** in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products.

20. METHOD OF AWARD - LOWEST RESPONSIBLE BIDDER(S)

If at the time this Contract is to be awarded, the lowest responsive Base Bid (with any accepted alternates) submitted by a responsible bidder does not exceed the amount of funds then estimated by the Owner as available to finance the Contract the contract will be awarded. However, if said bid exceeds such amount, or other lawful cause exists, the Owner may reject all bids.

21. Form AIA 101-2017 "Standard Form of Agreement Between Owner and Contractor" and AIA-A201-2017 "General Terms and Conditions" as modified by the Owner (and enclosed herein), shall be the standard agreement form used for Contracts for this project.

22. MANDATORY ELEC DISCLOSURE REQUIREMENT, P.L. 2005, CHAPTER 271

The Contractor is advised of its responsibility to file an annual disclosure statement on political contributions with the New Jersey Election Law Enforcement Commission (ELEC), pursuant to N.J.S.A. 19:44A-20.27 if the contractor receives contracts in excess of \$50,000 from a public entity in a calendar year. It is the contractor's responsibility to determine if filing is necessary. Failure to so file can result in the imposition of financial penalties by ELEC. Additional information about this requirement is available from ELEC at 888-313-3532 or at www.elec.state.nj.us.

In accordance with N.J.A.C. 6A:23A-6.3 the Board may not award a contract over \$17,500 to a bidder that has made a reportable contribution to a member of the district board of education during the preceding one-year period. Bidders must submit a C.271 Political Disclosure Form in the form provided with the Specifications at least ten (10) days prior to award.

23. NON-COLLUSION AFFIDAVIT

The Owner is requesting that the Non-Collusion Affidavit be included with the bid, but the bidder must provide the Non-Collusion Affidavit prior to the award.

24. DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

The Owner, pursuant to N.J.S.A. 18A:18A-49.4, shall implement and comply with Disclosure of Investment Activities in Iran N.J.S.A. 52:32-55 et seq.

Pursuant to N.J.S.A. 52:32-57 et seq. (P.L. 2012, c.25 and P.L. 2021, c.4) any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must certify, prior to the time a contract is awarded and at the time the contract is renewed, that neither the person nor entity, nor any of its parents, subsidiaries, or affiliates, is identified on the New Jersey Department of the Treasury's Chapter 25 List as a person or entity engaged in investment activities in Iran. The Chapter 25 list is found

INSTRUCTIONS TO BIDDERS

on the Division's website at <https://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Vendors/bidders must review this list prior to completing the below certification. If the Director of the Division of Purchase and Property finds a person or entity to be in violation of the law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

If the Board determines that a person or entity has submitted a false certification concerning its engagement in investment activities in Iran under N.J.S.A. 52:32-58, the board shall report to the New Jersey Attorney General the name of that person or entity, and the Attorney General shall determine whether to bring a civil action against the person to collect the penalty prescribed in N.J.S.A. 52:32-59.

In addition, bidders must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or any of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes on the lower portion of the enclosed form.

The Board has provided within the specifications, a Disclosure of Investments Activities certification form for all persons or entities, that plan to submit a bid, respond to a proposal, or renew a contract with the board, to complete, sign and submit prior to the award of the proposal.

The Disclosure of Investment Activities in Iran Form is to be completed, certified and submitted prior to the award of contract.

25. CERTIFICATION OF PROHIBITED ACTIVITIES IN RUSSIA AND/OR BELARUS

Pursuant to N.J.S.A. 52:32-60.1, et seq. (L. 2022, c. 3) a State agency or local unit, as applicable, shall require a person seeking to enter into or renew a contract to certify, before the contract is awarded, renewed, amended, or extended, that the person is not identified on a list created by the Department of the Treasury as a person engaging in prohibited activities in Russia or Belarus. The certification required shall be executed on behalf of the applicable person by an authorized officer or representative of the person. If a person is unable to make the certification required because the person or one of the person's parents, subsidiaries, or affiliates has engaged in prohibited activity in Russia or Belarus, the person shall provide to the State agency or local unit of government concerned, prior to the deadline for delivery of such certification, a detailed and precise description of such activities, such description to be provided under penalty of perjury. The certifications provided and disclosures provided shall be disclosed to the public. Engaged in prohibited activities in Russia or Belarus means (1) companies in which the Government of Russia or Belarus has any direct equity share; (2) having any business operations commencing after March 9, 2022 that involve contracts with or the provision of goods or services to the Government of Russia or Belarus; (3) being headquartered in Russia or having its principal place of business in Russia or Belarus, or (4) supporting, assisting or facilitating the Government of Russia or Belarus in their campaigns to invade the sovereign country of Ukraine, either through in-kind support or for profit.

The Certification of Prohibited Activities in Russia and/or Belarus Form is to be completed, certified and submitted prior to the award of contract.

INSTRUCTIONS TO BIDDERS

26. AMERICANS WITH DISABILITIES ACT, 42 U.S.C. 12101

The CONTRACTOR and the OWNER do hereby agree that the provisions of Title II of the Americans with Disabilities Act of 1990 (the "Act") (42 U.S.C. §12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the OWNER pursuant to this contract, the CONTRACTOR agrees that the performance shall be in strict compliance with the Act. In the event that the CONTRACTOR, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this Contract, the CONTRACTOR shall defend the OWNER in any action or administrative proceeding commenced pursuant to the Act. The CONTRACTOR shall indemnify, protect, and save harmless the OWNER, its agents, servants, and employees from and against any and all suits, claims, losses demands, or damages, or whatever kind or nature arising out of or claimed to arise out of the alleged violation. The CONTRACTOR shall at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the OWNER grievance procedure, the CONTRACTOR agrees to abide by any decision of the OWNER which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the OWNER or if the OWNER incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the CONTRACTOR shall satisfy and discharge the same at its own expense.

The OWNER shall, as soon as practicable after a claim has been made against it, give written notice thereof to the CONTRACTOR along with particulars of the claim then known by the OWNER. If any action or administrative proceedings is brought against the OWNER or any of its agents, servants, and employees, the OWNER shall expeditiously forward or have forwarded to the CONTRACTOR every demand, complaint, notice, summons, pleading, or other process received by the OWNER or its representatives. It is expressly agreed and understood that any approval by the OWNER of the services provided by the CONTRACTOR pursuant to this contract, or an independent violation by the OWNER, will not relieve the CONTRACTOR of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the OWNER pursuant to this paragraph. It is further agreed and understood that the OWNER assumes no obligation to indemnify or save harmless the CONTRACTOR, its agents, servants, employees and subcontractors for any claim which may arise out to their performance of this Agreement. Furthermore, the CONTRACTOR expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the CONTRACTOR'S obligations assumed in this agreement, nor shall they be construed to relieve the CONTRACTOR from any liability, nor preclude the OWNER from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

27. NEW JERSEY OFFICE OF CLEAN ENERGY REBATE

During the performance of the contract, if and when requested by the Owner or the Owner's Representative, Contractor shall provide all required documentation including Submittals, Shop Drawings, and Cost Information (for materials and installation) for any equipment, systems or components, in order for the Owner to pursue Grants and Reimbursement through the New Jersey Office of Clean Energy. The Contractor may be required to provide detailed pricing information including invoices of materials and a breakdown of labor or equipment costs as it pertains to individual pieces of equipment, systems or components.

INSTRUCTIONS TO BIDDERS

28. **STUDENT AND FACULTY SAFETY:**

During the performance of this contract, neither the Contractor nor any Subcontractor, where applicable, shall knowingly allow any employee registered pursuant to N.J.S.A. 2C:7-1, et seq. "Megan's Law," as a Tier 3 offender ("sex offenders determined to pose a relatively high risk of re-offense") or a Tier 2 offender ("sex offenders determined to pose a moderate risk of re-offense"), upon the Owner's property or the Project site. The Owner currently contracts with Visitor Aware by Singlewire.com for security screening. The Contractor will be required to purchase for the Owner a Complete Visitor Management screening and badging system (Visitor Aware by Singlewire Software) in order to conduct security checks on its employees and Subcontractors and to ensure compliance with these Student and Faculty Safety Requirements. The Contractor will be required to provide the Visitor Badge Labels and pay the yearly fee for the duration of the contract. The Owner currently contracts with Visitor Aware by Singlewire.com for security screening. The Contractor will be required to purchase for the Owner one (1) iPad, one (1) wall-mounted secured holder that will give them access to the rear camera, one (1) Brother QL-810Wc printer, and provide a power outlet near the iPad and wherever the printer will be located. Following completion of the work, the security verification system shall be turned over to the Owner. All employees of the Contractor and any Subcontractor, will be required to wear picture identification cards in a visible manner while working on the Owner's premises. During the performance of this contract, neither the Contractor nor any Subcontractor, where applicable, shall knowingly allow any employee to enter any area of the Project where students or faculty are present, without first providing the Owner with a written list setting forth the identity of the employees.

All personnel or agents of the Contractor shall observe all rules and regulations in effect at the Owner's premises. For purposes of this section, Contractor's personnel includes the personnel of subcontractors of any tier. Contractors shall assume full responsibility for the actions of all their personnel. During the performance of this contract, neither the Contractor nor any Subcontractor, where applicable, shall knowingly allow any employee to enter any area of the Project where students or faculty are present, without first providing the Owner with a written list setting forth the identity of the employees. Contractors shall maintain proper supervision of the work in progress at all times. All personnel used by the Contractor for the performance of this work shall be properly trained and qualified for work of this type and shall have the minimum ability and experience for his classification. The Contractor shall provide evidence of qualifications for any personnel performing work under contract upon request.

Employees, personnel, or agents of the Contractor, while on the Owner's property, shall be subject to the control of the Owner, but under no circumstances shall such persons be deemed to be employees, personnel, or agents of the Owner. Contractor's personnel are not to engage with any activities with the students, staff or other Owner's employees unless duly authorized to do so in writing by the Business Administrator or Superintendent. Owner reserves the right to refuse to accept services from any personnel deemed by the Owner or its representative to be unqualified, disorderly, or unable to perform assigned work.

Owner (and/or the Owner's Representatives) reserves the right to direct the removal from the site of any person, equipment and/or entity Owner and/or Owner's Representative reasonably deems unfit or who/which displays inappropriate behavior, including but not limited to, alcohol consumption, drugs, fighting, intimidating or disruptive behavior, the use of language reasonably considered inappropriate on school grounds, harassing or biased or prejudiced behavior, negligent or reckless behavior, vandalism, theft, improper storage, or illegal acts. Such behaviors or actions by Contractor's personnel shall be deemed a violation of the terms of the contract by Contractor.

INSTRUCTIONS TO BIDDERS

All personnel of the Contractor will be required to wear picture identification badges in a visible manner while working on the Owner's premises; the badges must identify the individual and the firm with which the individual is employed. Contractors' personnel are to wear uniforms whenever possible. At the beginning of each workday, Contractor shall provide a list to Construction Manager of all of Contractor's personnel on-site that day.

29. **CRIMINAL HISTORY BACKGROUND CHECKS – N.J.S.A. 18A:6-7.1:**

The Contractor and all subcontractors of any tier for the project shall provide to the Owner evidence or proof that each worker assigned to the project that comes in regular contact with students, has had a criminal history background check, and that said check indicates that no criminal history record information exists on file for that worker.

The determination of "regular contact with students" will be made by the Owner. Failure to provide proof of criminal history background check for any contractor or subcontractor employee coming in regular contact with students shall be a violation of the terms of the contract.

If it is discovered during the course of the contract that a contractor or subcontractor employee has a disqualifying criminal history or the employee has not had a criminal history background check, that employee is to be removed from the project immediately.

30. Covid-19 Requirements: All onsite personnel shall comply with the latest Federal, State and Local authorities having jurisdiction regarding Covid-19 protocols.

31. The successful bidder shall, after contract award, comply with and complete all required forms, written authorizations and/or other information issued by the Owner for the disclosure of information in accordance with the mandates of N.J.S.A. 18A:6-7.7 et seq. which concerns prior acts and/or investigations of sexual misconduct and/or child abuse for those contracted service providers who are employed in positions which involve regular contact with students. The successful bidder is further notified, to the extent permitted by N.J.S.A. 18A:6-7.8, that failure to provide truthful information or willfully failing to disclose information required by N.J.S.A. 18A:6-7.7 et seq., may subject the successful bidder to discipline up to, and including, termination or denial of employment; shall constitute a violation of the terms of the contract; may be a violation of N.J.S.A. 2C:28-3; and may be subject to a civil penalty of not more than \$500, which shall be collected in proceedings in accordance with the N.J.S.A. 2A:58-10 et seq.

32. ANTI-BULLYING BILL OF RIGHTS – REPORTING OF HARRASSMENT, INTIMIDATION AND BULLYING – CONTRACTED SERVICE

The Contractor shall comply with all applicable provisions of the New Jersey Anti-Bullying Rights Act – N.J.S.A. 18A:37-13.1 et seq. and N.J.S.A. 18A:37-16, all applicable code and regulations, and the Anti-Bullying Policy of the Owner. The district shall provide to the contracted service provider a copy of the Owner's Anti-Bullying Policy.

In accordance with N.J.A.C. 6A:16-7.7 (c), a contracted service provider, who has witnessed, or has reliable information that a student has been subject to harassment, intimidations, or bullying shall report the incident to any school administrator or safe schools resource officer, or the School Business Administrator/Board Secretary, who shall immediately initiate the Owner's procedures concerning harassment, intimidation and bullying.

INSTRUCTIONS TO BIDDERS

33. RECORD MAINTENANCE

Pursuant to N.J.A.C. 17:44-2.2, the Contractor shall maintain all documentation related to products, transactions or services under this Contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

34. CONTRACTOR PERFORMANCE EVALUATION

In accordance with N.J.S.A. 18A:18A-15, when the entire cost of the project will exceed \$20,000.00, the Board, through its authorized agent, shall upon the completion of the contract report to the Department of the Treasury as to the Contractor's performance, and shall also furnish such report from time to time during performance if the Contractor is then in default.

35. The Owner's officials and/or employees are precluded from taking part in the negotiations or the awarding of contracts to companies with which they may have a financial or personal interest.

36. The Owner represents that none of its employees, and to the best of its knowledge, none of its contracted parties or employees of its contracted parties, are engaged in any conduct that would constitute a conflict of interest or a violation of the School Ethics Act.

37. The Contractor and its Subcontractors may be debarred, suspended or disqualified from contracting and/or working on the School Facilities Project if found to have committed any of the acts listed in N.J.A.C. 17:19-4.1.

38. The Owner shall keep those records and accounts and shall require all Contracted Parties including the Contractor and Subcontractors to keep those records and accounts for the School Facilities Projects as necessary in order to evidence compliance with the Public Schools Contracts Law.

39. The Contractor agrees to retain during the term of the Contract and for 10 years after closeout thereafter all financial records, supporting documents and other records which relate in any way to the work. If any litigation, claim or audit is commenced prior to the expiration date, such records and documents shall be retained by the Contractor until all litigation, claims or audit findings involving the records have been resolved.

END OF SECTION

BID FORM

DATE: _____

Bidder's Information: (Print or Type)

Company Name: _____

Contact Name: _____

Contact Email Address: _____

Company Address: _____

Telephone Number: _____

Fax Number: _____

**Penns Grove – Carneys Point Regional Board of Education
100 Iona Avenue
Penns Grove, New Jersey 08069**

Ladies and Gentlemen:

This Proposal is submitted in accordance with your Notice to Bidders inviting proposals to be received for the **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition**. Having carefully examined the Contract Documents and being familiar with various conditions affecting the work, the undersigned herein agrees to furnish all materials, perform all labor and do all else necessary to complete the **ENTIRE PROJECT** in accordance with said Contract Documents for the **TOTAL LUMP SUM BASE BID (including the allowance) OF:**

BID AMOUNT \$ _____

PLUS CASH ALLOWANCE
SECTION 01210 – ALLOWANCES, ITEM 3.3.A \$ 150,000.00

PLUS ALLOWANCE
SECTION 01210 – ALLOWANCES, ITEM 3.3.B \$ _____

TOTAL LUMP SUM BASE BID (Numbers) (Bid Amount plus Allowances)
\$ _____

(Words) _____

Amount shall be shown in both words and numbers. In case of discrepancy, the amount shown in words shall govern.

BID FORM

SUBCONTRACTOR DISCLOSURE

The Penns Grove – Carneys Point Regional Board of Education called “Owner” in accordance with bidding requirements for the work titled **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition** for the portions of the Work below listed, the undersigned proposes to use the following Prime Subcontractors (indicate “Self-Performing” if you are doing the portion of the work required – please note you must be Pre-Qualified for the work to be “Self-Performing”) pursuant to N.J.S.A. 18A:18A-18:

PORTION OF WORK

PRIME SUBCONTRACTOR’S NAME AND ADDRESS

Structural Steel Work (C029)

Heating and Ventilating Systems and Equipment (C032)

Plumbing Work (C030)

Electrical Work (C047)

BID FORM

ALTERNATES

An alternate is an amount proposed by bidders and stated herein for certain work that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents. The Owner will select Alternate Bid Items in its best interest and subject to its budgetary limitations. **If selected Alternates are applicable**, the lowest responsible bid and contract price will be calculated as the sum of the base bid and the amount bid for the selected Alternate Bid Items. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

SCHEDULE OF ALTERNATES: The Bidder shall enter the amount to be added or deducted from the base contract amount for each alternate listed below. Fill in "\$0.00" if no cost is associated with an alternate.

1. **FIRE ALARM SYSTEM REPLACEMENT:** Alternate Bid #1 - provide all new fire alarm devices in the existing school tied into a new fire alarm panel. Include all costs to remove all existing fire alarm equipment, panels and wiring. As part of the Base Bid, the new voice evacuation fire alarm panel will only serve the new addition.

Alternate #1 – ADD \$ _____

2. **FRONT PARKING LOT:** Alternate Bid #2 shall include, but is not limited to, all the necessary site clearing, earthwork, concrete, asphalt, utility modifications, storm infrastructure, traffic control measures, striping and landscaping to make the necessary site improvements to provide a new parking lot as illustrated on the construction plans. All improvements include the necessary restoration where construction activities have taken place. See the Site Drawing for details.

Alternate #2 – ADD \$ _____

3. **SHADE STRUCTURE:** Alternate Bid #3 shall include, but is not limited to, the purchase and installation of a shade pavilion near the proposed playground. The Contractor shall provide the footings and all necessary materials to install a fully functional shade pavilion. See the Site Drawing for details.

Alternate #3 – ADD \$ _____

BID FORM

UNIT PRICES

A Unit price is an amount proposed by bidders, stated herein, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.

Unit prices include all necessary material to fully furnish, plus cost for delivery, installation, insurance, overhead, profit, and applicable taxes. The prices shown in the schedule are for additions and deductions to the contract.

Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections. The Owner reserves the right to reject the Bidder's measurement of work-in-place that involves use of established unit prices, and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Bidder.

UNIT PRICE SCHEDULE: The Bidder shall submit a price for each item listed below. Fill in "\$0.00" if no cost is associated with a particular line item. A blank space next to a particular line item shall mean that there is no cost associated with such line item.

- | | | | |
|----|--|----|----------|
| 1. | Soil Replacement Unit Price
Over excavation, removal from site, and imported structural fill place in lifts | CY | \$ _____ |
| 2. | Subbase Repairs for Asphalt Areas Unit Price
12" over excavation with installation 12" of DGA | CY | \$ _____ |

BID FORM

The undersigned hereby certifies that this Proposal is genuine and not sham or collusive or made in the interest of or in behalf of any person, firm or corporation not herein named and that the undersigned has not directly or indirectly induced or solicited any bidder to refrain from bidding and that the undersigned has not in any manner sought by collusion to secure for himself any advantages over any other bidder.

The undersigned, intending to be legally bound, agrees that this Proposal shall be irrevocable and shall remain subject to your acceptance for 60 days after date set for bid opening.

The undersigned submits this Proposal with the full knowledge of the Contract requirements and hereby agrees that the work of this Project, under the Contract, shall be fully and finally completed and ready for occupancy in accordance with the date found in Specification Section 01010 – Summary of Work.

NAME OF BIDDER

SIGNATURE

DATE

ACKNOWLEDGMENT OF RECEIPT OF ADDENDA / CLARIFICATIONS

The undersigned Bidder hereby acknowledges receipt of the following Addenda:

<u>Addendum Number</u>	<u>Dated</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

<u>Clarification Number</u>	<u>Dated</u>
_____	_____
_____	_____
_____	_____

Check here if No Addenda / Clarifications were issued.

Acknowledged for: _____
(Name of Bidder)

By: _____
(Signature of Authorized Representative)

Name: _____

Title: _____

FAILURE TO COMPLETE AND RETURN THIS FORM WITH YOUR BID SUBMISSION SHALL BE CAUSE FOR YOUR BID TO BE REJECTED

STATEMENT OF OWNERSHIP
(OWNERSHIP DISCLOSURE CERTIFICATION)
N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This Statement Shall Be Included with All Bid and Proposal Submissions

Name of Business: _____

Address of Business: _____

Name of person completing this form: _____

N.J.S.A. 52:25-24.2:

"No corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or proposal, or accompanying the bid or proposal of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be.

If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest."

This Ownership Disclosure Certification form shall be completed, signed and notarized.

Failure of the bidder/proposer to submit the required information is cause for automatic rejection of the bid or proposal.

Part I

Check the box that represents the type of business organization:

- Sole Proprietorship
- Non-Profit Corporation (skip Parts II and III, sign and notarize at the end)
- Partnership Limited Partnership Limited Liability Partnership
- Limited Liability Company
- For-profit Corporation (including Subchapters C and S or Professional Corporation)
- Other (be specific): _____

Part II

- I certify that the list below contains the names and addresses of all stockholders in the corporation who own ten percent (10%) or more of its stock, of any class, or of all individual partners in the partnership who own a ten percent (10%) or greater interest therein, or of all members in the limited liability company who own a ten percent (10%) or greater interest therein, as the case may be.

OR

- I certify that no one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or that no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be.

Sign and notarize the form below, and complete the list below. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member, meeting or exceeding the 10 percent ownership criteria established in N.J.S.A. 52:25-24.2, has been listed. (Please attach additional sheets if more space is needed):

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Name: _____

Address: _____

Part III - Ten Percent Owners of Owners Identified in Part II:

“To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a ten percent (10%) or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent filing, and, if there is any person that holds a ten percent (10%) or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent filing, and the relevant page numbers of the filings that contain the information on each person that holds a ten percent (10%) or greater beneficial interest.”

- Pages attached with name and address of each publicly traded entity as well as the name and address of each person that holds a ten percent (10%) or greater beneficial interest.

AND

- Submit here the links to the Websites (URLs) containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent.

AND

- Submit here the relevant page numbers of the filings containing the information on each person holding a 10 percent or greater beneficial interest.

AND

List the names and addresses of each stockholder, partner or member owning a ten percent (10%) or greater interest in any corresponding corporation, partnership and/or limited liability company listed in Part II **other than for any publicly traded parent entities referenced above**. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member meeting or exceeding the ten percent (10%) ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Address

Subscribed and sworn before me this ____ day of _____, 20____.

(Notary Public)

My Commission expires:

(Affiant)

(Print name of affiant and title if applicable)

(Corporate Seal if a Corporation)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____
Company Name

Company Address

as Principal, and _____
Surety Company Name

Surety Company Address

as Surety, are hereby and firmly bound unto **Penns Grove – Carneys Point Regional Board of Education, 100 Iona Avenue, Penns Grove, New Jersey 08069** as Owner, in the penal sum of Ten Percent of the Amount of Bid Not to Exceed Twenty Thousand and 00/100 Dollars (10% Not to Exceed \$20,000.00) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed, this _____ Day of _____, 20_____.

The condition of the above obligation is such that, whereas the Principal has submitted to **Penns Grove – Carneys Point Regional Board of Education** a certain bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition**.

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be accepted and the Principal shall execute and deliver an AIA Document A101 Standard Form of Agreement Between Owner and Contractor (properly completed and amended in accordance with said Bid) and shall furnish bonds for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of the Bid,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims thereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper offer, the day and year first set forth above.

Company Name

Attest / Witness

Signature

By: _____

Signature

Name and Title

Surety Company Name

Signature

By: _____

Signature

Name and Title

ANY BOND COMPLYING WITH THE REQUIREMENTS OF N.J.S.A 18A:18A-24 MAY BE USED.

CONSENT OF SURETY

The _____

(Name and Address of Surety)

a corporation existing under the Laws of the State of _____
and authorized to do business under the Laws of the State of New Jersey, hereby certifies that application
has been made to us by

(Name and Address of Contractor)

and satisfactory arrangements have been completed by which we have and do now agree to furnish a
Performance Bond, Payment Bond, and Maintenance Bond each equal to 100% of the Contract price to
ensure the faithful performance on the part of the Bidder of the terms and conditions of the contract.

Title of the Work: Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition

Location of the Project: 251 East Maple Avenue, Penns Grove, NJ 08069

This proposition is made with the understanding that any change made in the specifications or agreements
without the consent of the bondsman shall in no way vitiate the bond.

WITNESS:

SURETY COMPANY

(Name of Surety Company)

Title: _____

(Attorney-in-fact)

By: _____

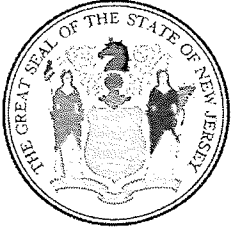
Date: _____

(Affix corporate seal)

IMPORTANT NOTE

The Surety Company executing the Bond must be authorized to transact business in the State of New
Jersey. For contracts in excess of \$850,000, the Surety shall be listed on the Treasury Department's most
current New Jersey List of Approved Sureties, located at www.state.nj.is/dobi/surety.htm.

ANY FORM CONSENT OF SURETY COMPLYING WITH THE REQUIREMENTS OF N.J.S.A. 18A:18A-25 MAY BE USED.



State of New Jersey

DEPARTMENT OF THE TREASURY
DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION
33 W. STATE STREET
PO BOX 034
TRENTON, NEW JERSEY 08625-0034

REPLY TO:
TEL: (609) 943-3400
FAX: (609) 292-7651

TOTAL AMOUNT OF UNCOMPLETED CONTRACTS

(This form is to be used with the NOTICE OF CLASSIFICATION when submitting bids to the Department of Education.)

I Certify that the amount of uncompleted work on contracts is \$ _____ .

The amount claimed includes uncompleted portions of all currently held contracts from all sources (public and private) in accordance with N.J.A.C. 17:19-2.13.

I further certify that the amount of this bid proposal, including all outstanding incomplete contracts does not exceed my prequalification dollar limit.



Respectfully submitted,

By _____

Name of Firm

Signature

Title

Business Address

Phone

Sworn to and
subscribed before me
This day of
20

Notary Public

NO MATERIAL ADVERSE CHANGE IN QUALIFICATION

AFFIDAVIT

I, _____ being of full age under oath depose and say:

1. I am a(n) owner, partner, shareholder or officer of the company set forth below and am duly authorized to execute this affidavit on its behalf.
2. A statement as to the financial ability, adequacy of plant and equipment, organization and prior experience of Bidder as required by N.J.S.A. 18A:18A-28 has been submitted to the Department of Treasury within one (1) year preceding the date of opening of bids for this contract.
3. I certify, as required by N.J.S.A. 18A:18A-32 that there has been no material adverse change in the qualification information of Bidder since such statement was submitted to the Department of Treasury except: _____

SEAL

SIGNATURE

TITLE

COMPANY

DATE

Sworn to and subscribed
before me this day
of _____, 20____.

Notary Public

C. 271 POLITICAL CONTRIBUTION DISCLOSURE FORM

Contractor Instructions

Business entities (contractors) receiving contracts from a public agency that are NOT awarded pursuant to a “fair and open” process (defined at N.J.S.A. 19:44A-20.7) are subject to the provisions of P.L. 2005, c. 271, s.2 (N.J.S.A. 19:44A-20.26). This law provides that 10 days prior to the award of such a contract, the contractor shall disclose contributions to:

- any State, county, or municipal committee of a political party
- any legislative leadership committee*
- any continuing political committee (a.k.a., political action committee)
- any candidate committee of a candidate for, or holder of, an elective office:
 - of the public entity awarding the contract
 - of that county in which that public entity is located
 - of another public entity within that county
 - or of a legislative district in which that public entity is located or, when the public entity is a county, of any legislative district which includes all or part of the county

The disclosure must list reportable contributions to any of the committees that exceed \$300 per election cycle that were made during the 12 months prior to award of the contract. See N.J.S.A. 19:44A-8 and 19:44A-16 for more details on reportable contributions.

N.J.S.A. 19:44A-20.26 itemizes the parties from whom contributions must be disclosed when a business entity is not a natural person. This includes the following:

- individuals with an “interest” ownership or control of more than 10% of the profits or assets of a business entity or 10% of the stock in the case of a business entity that is a corporation for profit
- all principals, partners, officers, or directors of the business entity or their spouses
- any subsidiaries directly or indirectly controlled by the business entity
- IRS Code Section 527 New Jersey based organizations, directly or indirectly controlled by the business entity and filing as continuing political committees, (PACs).

When the business entity is a natural person, “a contribution by that person’s spouse or child, residing therewith, shall be deemed to be a contribution by the business entity.” [N.J.S.A. 19:44A-20.26(b)] The contributor must be listed on the disclosure.

Any business entity that fails to comply with the disclosure provisions shall be subject to a fine imposed by ELEC in an amount to be determined by the Commission which may be based upon the amount that the business entity failed to report.

The enclosed list of agencies is provided to assist the contractor in identifying those public agencies whose elected official and/or candidate campaign committees are affected by the disclosure requirement. It is the contractor’s responsibility to identify the specific committees to which contributions may have been made and need to be disclosed. The disclosed information may exceed the minimum requirement.

The enclosed form, a content-consistent facsimile, or an electronic data file containing the required details (along with a signed cover sheet) may be used as the contractor’s submission and is disclosable to the public under the Open Public Records Act.

The contractor must also complete the attached Stockholder Disclosure Certification. This will assist the agency in meeting its obligations under the law. **NOTE: This section does not apply to Board of Education contracts.**

* N.J.S.A. 19:44A-3(s): “The term “legislative leadership committee” means a committee established, authorized to be established, or designated by the President of the Senate, the Minority Leader of the Senate, the Speaker of the General Assembly or the Minority Leader of the General Assembly pursuant to section 16 of P.L.1993, c.65 (C.19:44A-10.1) for the purpose of receiving contributions and making expenditures.”

**List of Agencies with Elected Officials Required for Political Contribution Disclosure
N.J.S.A. 19:44A-20.26**

County Name: Salem

State: Governor, and Legislative Leadership Committees

Legislative District #s: 3

State Senator and two members of the General Assembly per district.

County:

Freeholders

County Clerk

Sheriff

Surrogate

Municipalities (Mayor and members of governing body, regardless of title):

Alloway Township

Carneys Point Township

Elmer Borough

Elsinboro Township

Lower Alloways Creek Township

Mannington Township

Oldmans Township

Penns Grove Borough

Pennsville Township

Pilesgrove Township

Pittsgrove Township

Quinton Township

Salem City

Upper Pittsgrove Township

Woodstown Borough

Boards of Education (Members of the Board):

Alloway Township

Elmer Borough

Elsinboro Township

Lower Alloways Creek

Mannington Township

Oldmans Township

Penns Grove-Carney's Point Regional

Pennsville

Pittsgrove Township

Quinton Township

Salem City

Upper Pittsgrove Township

Woodstown-Pilesgrove Regional

Fire Districts (Board of Fire Commissioners):

Pittsgrove Township Fire District No. 1

Pittsgrove Township Fire District No. 2

Pittsgrove Township Fire District No. 3

HOLD HARMLESS AGREEMENT

It is further agreed that the undersigned hereby agrees to defend, indemnify and hold harmless the Board of Education, its officers, employees, volunteers and agents, from and against all claims, damages, losses, and expenses, including reasonable attorney's fees and costs, in case it shall be necessary to file an action or claim or in case an action or claim is brought or made which is; 1) for personal or bodily injury, illness or death, for property damage, including loss of use, or for any economic loss and; 2) caused in whole or in part by _____ (Name of Bidder's) alleged negligent acts or omissions, breaches of contract, or otherwise arising out of their work, or those of a subcontractor, or that of anyone employed by them, or for whose acts contractor or subcontractor may be liable. Contractor's obligation hereunder shall apply in all instances whether the Board of Education, its officers, employees, volunteers and/or agents is/are made a party to the action or claim or is subsequently made a party to the action by third-party in-pleading or is made a part to a collateral action arising, in whole or in part, from any of the issues emanating from the original cause of action or claim. The Contractor's obligation hereunder shall apply even when such claims, damages, losses and expenses are caused in part by the Board of Education, its officers, employees, volunteers or agents.

Full Name of Contractor: _____

Business Address: _____

Telephone Number: () Zip Code _____

Project Description: _____

Signature / Authorized Person _____

Print Name: _____

Witness Signature _____

Print Name: _____

CERTIFICATION REGARDING THE DEBARMENT, SUSPENSION, INELIGIBILITY AND
VOLUNTARY EXCLUSION

I am _____ of the firm of _____,
(your title) (name of your organization)

(state the address of your organization)

CHOOSE ONE OF THE FOLLOWING

- () A. I hereby certify on behalf of _____ that
(name of your organization)
neither it nor its principals are presently debarred, suspended, declared ineligible, subject
to notice that debarment is being considered or reviewed or may be imposed, or
voluntarily excluded from public contracting by the State of New Jersey, any department
or agency thereof, or any Federal department or agency.
- () B. I am unable to certify to any of the statements set forth in this
certification. I have attached an explanation to this form.

(Signature)

(Type Name & Title)

(Date)

CERTIFICATION REGARDING THE DEBARMENT, SUSPENSION, INELIGIBILITY AND
VOLUNTARY EXCLUSION

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this certification, the contracting firm is providing the certification as set out above.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the contracting firm knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the District may pursue available remedies including suspension and/or debarment.
3. The contracting firm shall provide immediate written notice to the District if at any time it learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction", "debarred", "suspended", "ineligible", "lower tier covered transaction", "participant", "person", "primary covered transaction", "principal", and "voluntarily excluded", as used in this certification, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the District for assistance in obtaining a copy of those regulations.
5. The contracting firm agrees by submitting this certification that, should the covered transaction be entered into, it shall not knowingly enter into any transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction.
6. The contracting firm further agrees by submitting this certification that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion" without modification, in all subcontracts to this agreement as authorized by the District.
7. The Contractor may be debarred, suspended or disqualified from contracting and/or working on the Work if found to have committed any of the acts listed in N.J.A.C. 17:19-4.1. The Contractor shall insert in all of its contracts with subcontractors a clause stating that the subcontractor may be debarred, suspended or disqualified from contracting and/or working on the Work if found to have committed any of the acts listed in N.J.A.C. 17.19-4.1 .
8. All Bidders shall submit a sworn statement indicating whether the Bidder, at the time of the Bid, is included on the State Treasurer's, or the Federal Government's List of Debarred, Suspended or Disqualified Bidders as a result of action taken by any State or Federal Agency. The Owner shall immediately notify the State of New Jersey and the Unit of Fiscal Integrity of the Office of the Attorney General whenever it appears that a bidder is on the State Treasurer's or the Federal Government's List.

Summary of the Certification Requirements under N.J.S.A. 52:32-44.1

Pursuant to state law any natural person, company, firm, association, corporation, or other entity prohibited, or “debarred,” from contracting with the federal government agencies, shall also be prohibited from contracting for public work in the state of New Jersey. This prohibition also extends to any affiliate organization(s) held by or subject to the control of an entity of that prohibited person or entity.

Prior to awarding a contract for public work a local units must obtain written certification from the contracting person or entity through the form below, attesting to their non-debarment from contracting with federal government agencies. Contracting units are reminded that they must fill-in the boilerplate information in the certification sections of Parts II through IV regarding their name and type of contracting unit before using the form.

**CERTIFICATION OF NON-DEBARMENT
FOR FEDERAL GOVERNMENT CONTRACTS**

N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)

This certification shall be completed, certified to, and submitted to the contracting unit prior to contract award, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION	
Individual or Organization Name	
Physical Address of Individual or Organization	
Unique Entity ID (if applicable)	
CAGE/NCAGE Code (if applicable)	
Check the box that represents the type of business organization:	

- Sole Proprietorship (skip Parts III and IV)
 Non-Profit Corporation (skip Parts III and IV)
 For-Profit Corporation (any type)
 Limited Liability Company (LLC)
 Partnership
 Limited Partnership
 Limited Liability Partnership (LLP)
 Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization			
I hereby certify that the individual or organization listed above in Part I is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the Penns Grove - Carneys Point Regional Board of Education is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by the Board of Education to notify the Board of Education in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the Board of Education , permitting the Board of Education to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50 Percent of Organization

Section A (Check the Box that applies)

<input type="checkbox"/>	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.
Name of Individual or Organization	
Physical Address	
OR	
<input type="checkbox"/>	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.

Section B (Skip if no Business entity is listed in Section A above)

<input type="checkbox"/>	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity	
Physical Address	
OR	
<input type="checkbox"/>	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.

Section C – Part III Certification

I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the **Organization listed above in Part I** or, if applicable, owns greater than 50 percent of a parent entity of the **Penns Grove - Carneys Point Regional Board of Education**. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the **Board of Education** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award **the Board of Education** to notify the **Board of Education** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the **Board of Education**, permitting the **Board of Education** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

Part IV – CERTIFICATION OF NON-DEBARMENT: Contractor – Controlled Entities

Section A



Below is the name and address of the corporation(s) in which the **Organization listed in Part I** owns more than 50 percent of voting stock, or of the partnership(s) in which the **Organization listed in Part I** owns more than 50 percent interest therein, or of the limited liability company or companies in which the **Organization listed above in Part I** owns more than 50 percent interest therein, as the case may be.

Name of Business Entity	Physical Address

Add additional sheets if necessary

OR



The **Organization listed above in Part I** does not own greater than 50 percent of the voting stock in any corporation and does not own greater than 50 percent interest in any partnership or any limited liability company.

Section B (skip if no business entities are listed in Section A of Part IV)

<input type="checkbox"/>	Below are the names and addresses of any entities in which an entity listed in Part III A owns greater than 50 percent of the voting stock (corporation) or owns greater than 50 percent interest (partnership or limited liability company).
Name of Business Entity Controlled by Entity Listed in Section A of Part IV	Physical Address
Add additional Sheets if necessary	
<p align="center">OR</p>	
<input type="checkbox"/>	No entity listed in Part III A owns greater than 50 percent of the voting stock in any corporation or owns greater than 50 percent interest in any partnership or limited liability company.

Section C – Part IV Certification

I hereby certify that the Organization listed above in Part I does not own greater than 50 percent of any entity that that is debarred by the federal government from contracting with a federal agency and, if applicable, does not own greater than 50 percent of any entity that in turns owns greater than 50 percent of any entity debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the Penns Grove - Carneys Point Regional Board of Education is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by the Board of Education to notify the Board of Education in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the Board of Education , permitting the Board of Education to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

AFFIRMATIVE ACTION REQUIREMENTS

Bidder is required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

1. After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an Initial Project Workforce Report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7.
2. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The undersigned certifies that he/she is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq. and agrees to furnish the required forms of evidence.

Subscribed and sworn to before me this

_____ day of _____, 202__.

My Commission expires:

Date

Signature

Name and Title
(Type or Print)

EXHIBIT B

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127) N.J.A.C. 17:27-1.1 et seq.

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

EXHIBIT B (Cont)

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contractor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided

EXHIBIT B (Cont)

further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer. The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

Each contractor shall submit to the public agency, prior to execution of a public agency contract a completed form AA201:

*****The Board of Education recognizes the right of its employees/students to work and study in an environment that is free from sexual harassment. Immediate and appropriate action will be taken against any vendor/agent of the Board found liable for sexually harassing any employee/student.**

NON-COLLUSION AFFIDAVIT

STATE OF NEW JERSEY)

COUNTY OF)

I, _____ of the City of _____ in the County of _____ and the State of _____ of full age, being duly sworn according to law on my oath depose and say that: I am of the firm of _____ the bidder making this Proposal/Bid for the **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition**, and that I executed the said Bid with full authority so to do; that said bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the **Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition** and that all statements contained in said Bid and in this affidavit are true and correct, and made with full knowledge that the Owner relies upon the truth of the statements contained in said Bid and in the statements contained in this affidavit in awarding the contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by

(Name of Bidder)

Bidder's Signature

Sworn to and subscribed before me

this ___ day of _____, 20___.

Notary Public of

My Commission expires _____ 20___

EQUIPMENT CERTIFICATION

In accordance with 18A:18A-23, The undersigned bidder hereby certifies as follows:

The bidder owns, leases or controls all necessary equipment required to accomplish the work described in the Contract Documents.

Name of Bidder: _____

Signature: _____

Name of Signor: _____

Title: _____

Date: _____

If the bidder is not the actual owner or lessee of such equipment, bidder shall provide the source(s) of such equipment and provide certifications from the owners or other persons controlling such equipment definitely granting to the bidder the control of the equipment required during such times as may be necessary for the completion of that portion of the contract for which that equipment is necessary.

Equipment Source(s):
(if any necessary equipment not owned or leased)

(entity name and physical address)

(entity name and physical address)

(entity name and physical address)

Add additional sheets if necessary for additional sources

Attach Required Certifications for Each Source
(if any necessary equipment not owned or leased)

STANDARD BID DOCUMENT REFERENCE

STANDARD BID DOCUMENT REFERENCE						
Name of Form	DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN					
Statutory Reference	N.J.S.A. 52:32-55 et seq. N.J.S.A. 40A:11-2.1 N.J.S.A. 18A:18A-49.4					
Applicability		Y/N		Mandatory	Optional	N/A
	LPCL	Y	Goods and Services	X		
	PSCL	Y	Construction			X
Instructions Reference						
Description	P.L. 2012, c.25 prohibits the awarding of State and local public contracts for goods and services with persons or entities engaging in certain investment activities in energy or finance sectors of Iran. Prior to contract award, vendors and contractors must certify that neither they nor any parent entity, subsidiary, or affiliate is listed on the New Jersey Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List").					

The Certification form requires the insertion of contracting unit identification information which should be filled in (in italics on the form) prior to its use.

Disclosure of Investment Activities in Iran

Person or Entity

Part 1: Certification

COMPLETE PART 1 BY CHECKING **EITHER BOX.**

Pursuant to Public Law 2012, c. 25, any person or entity that is a successful bidder or proposer, or otherwise proposes to enter into or renew a contract, must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any parent entity, subsidiary, or affiliate is identified on the State Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The list is found on Treasury's website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf.

The Chapter 25 list must be reviewed prior to completing the below certification. If a vendor or contractor is found to be in violation of law, action may be taken as appropriate and as may provided by law, rule or contract, including but not limited to imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.



I certify, pursuant to Public Law 2012, c. 25, that neither the person or entity listed above, nor any parent entity, subsidiary, or affiliate thereof is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

OR



I am unable to certify as above because the person or entity and/or a parent entity, subsidiary, or affiliate thereof is listed on the N.J. Department of the Treasury's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below sign and complete the Certification below.

Part 2: Additional Information

PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN.

You must provide a detailed, accurate and precise description of the activities of the person or entity, or a parent entity, subsidiary, or affiliate thereof engaging in investment activities in Iran below and, if more space is needed, on additional sheets provided by you.

Part 3: Certification of True and Complete Information

I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments there to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity.

*I acknowledge that the **Penns Grove – Carneys Point Regional Board of Education** is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the **Penns Grove – Carneys Point Regional Board of Education** to notify the **Penns Grove – Carneys Point Regional Board of Education** in writing of any changes to the answers of information contained herein.*

*I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the **Penns Grove – Carneys Point Regional Board of Education** and that the **Penns Grove – Carneys Point Regional Board of Education** at its option may declare any contract(s) resulting from this certification void and unenforceable.*

Full Name (Print)		Title	
Signature		Date	



CERTIFICATION OF NON-INVOLVEMENT IN PROHIBITED ACTIVITIES IN RUSSIA OR BELARUS

Pursuant to N.J.S.A. 52:32-60.1, et seq. (L. 2022, c. 3) any person or entity (hereinafter "Vendor") that seeks to enter into or renew a contract with a State agency for the provision of goods or services, or the purchase of bonds or other obligations, must complete the certification below indicating whether or not the Vendor is identified on the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list, available here: <https://sanctionssearch.ofac.treas.gov/>. If the Department of the Treasury finds that a Vendor has made a certification in violation of the law, it shall take any action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

I, the undersigned, certify that I have read the definition of "Vendor" below, and have reviewed the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list, and having done so certify:

(Check the Appropriate Box)

A. That the Vendor is not identified on the OFAC Specially Designated Nationals and Blocked Persons list on account of activity related to Russia and/or Belarus.

OR

B. That I am unable to certify as to "A" above, because the Vendor is identified on the OFAC Specially Designated Nationals and Blocked Persons list on account of activity related to Russia and/or Belarus.

OR

C. That I am unable to certify as to "A" above, because the Vendor is identified on the OFAC Specially Designated Nationals and Blocked Persons list. However, the Vendor is engaged in activity related to Russia and/or Belarus consistent with federal law, regulation, license or exemption. A detailed description of how the Vendor's activity related to Russia and/or Belarus is consistent with federal law is set forth below.

(Attach Additional Sheets If Necessary.)

Signature of Vendor's Authorized Representative

Print Name and Title of Vendor's Authorized Representative

Vendor's Name

Vendor's Address (Street Address)

Vendor's Address (City/State/Zip Code)

Date

Vendor's FEIN

Vendor's Phone Number

Vendor's Fax Number

Vendor's Email Address

ⁱ Vendor means: (1) A natural person, corporation, company, limited partnership, limited liability partnership, limited liability company, business association, sole proprietorship, joint venture, partnership, society, trust, or any other nongovernmental entity, organization, or group; (2) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in Section 1701(c)(3) of the International Financial Institutions Act, 22 U.S.C. 262r(c)(3); or (3) Any parent, successor, subunit, direct or indirect subsidiary, or any entity under common ownership or control with, any entity described in paragraph (1) or (2).

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The Contractor and the Penns Grove - Carneys Point Regional Board of Education, (hereafter "owner") do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 (the "Act") (42 U.S.C. S12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to the Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with particulars of the claim then known by the owner. If any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the owner shall expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract, or an independent violation by the owner, will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other action's available to it under any other provisions of the Agreement or otherwise at law.

PERFORMANCE AND PAYMENT BOND

Bond No. _____ [Principal] _____

KNOW ALL MEN BY THESE PRESENTS, that we, _____,
as Principal, and _____,
a corporation duly authorized to do business in the State of New Jersey, as Surety (the "Surety"), are
hereby held and firmly bound unto

**Penns Grove – Carneys Point Regional School District
100 Iona Avenue
Penns Grove, New Jersey 08069**

(hereinafter called the "Obligee") in the penal sum of _____ [100% of the Contract Amount]
Dollars, (\$ _____),

for the payment of which will and truly to be made, we hereby jointly and severally bind ourselves, our
heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 20 ____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, THAT WHEREAS, the above named
Principal did, on the _____ day of _____, 20____, enter into a Contract with the Obligee for
Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition; which said Contract is made a
part of this, the Bond, the same as though set forth herein:

NOW THEREFORE, if the said _____ [Principal] _____
shall well and faithfully do and perform the things agreed by [Principal] _____ [Principal] _____
to be done and performed in accordance to the terms of said Contract, and shall pay all lawful claims of
subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials,
provisions or other supplied, fuels, oils, implements, or machinery furnished, used or consumed in the
carrying forward, performing or completing of said Contract as required by N.J.S.A. 2A:44-143, we
agreeing and assenting that this undertaking shall be for the benefit of any subcontractors, materialmen,
laborers, persons, firms or corporations having a just claim as required by N.J.S.A. 2A:44-143, as well as
for the Obligee herein, then this obligation shall be void; otherwise, the same shall remain in full force
and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims
hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID SURETY hereby stipulates and agrees that no modifications, omissions or additions in or to
the terms of the said Contract or in or to the Drawings or Specifications therefor shall in any way affect
the obligation of said Surety on its Bond.

PERFORMANCE AND PAYMENT BOND

THIS BOND is given in compliance with the requirements of the statutes of the State of New Jersey in respect to bonds of contractors on public works (including N.J.S.A. 2A:44-143 et seq.) and liability hereunder is as limited and expansive as said statutes provide.

Signed and Sealed this _____ day of _____, 20__.

Principal Name

Witness:

As to Principal

By: _____
Principal Signature [SEAL]

Surety Name

As to Surety

By: _____
Surety Signature [SEAL]

MAINTENANCE BOND

Bond No. _____ [Principal] _____

KNOW ALL MEN BY THESE PRESENTS, that we, _____,
as Principal, and _____,
a corporation duly authorized to do business in the State of New Jersey, as Surety (the "Surety"), are
hereby held and firmly bound unto

Penns Grove – Carneys Point Regional School District
100 Iona Avenue
Penns Grove, New Jersey 08069

(hereinafter called the "Obligee") in the penal sum of _____ [100% of the Contract Amount] _____ Dollars,
(\$ _____),
for the payment of which will and truly to be made, we hereby jointly and severally bind ourselves, our
heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 20 _____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, THAT WHEREAS, the above named
Principal did, on the _____ day of _____, 20 _____, enter into a Contract with the Obligee for
Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition; which said Contract is made a
part of this, the Bond, the same as though set forth herein:

NOW THEREFORE, if the said _____ [Principal] _____ shall remedy without
cost to the Obligee any defects which may develop during the two (2) year Maintenance Period of the
work performed under the said Contract, provided such defects, in the judgment of the Obligee are caused
by defective or inferior materials or workmanship, then this obligation shall be void, otherwise it shall be
and remain in full force and effect. The two (2) year period shall commence on the date established by
Obligee's final acceptance of the Principal's Work.

The said Surety hereby stipulates and agrees that no modifications, deletions or additions in or to the
terms of the said Contract or the plans or specifications therefor shall in any way affect its obligations on
this bond.

[LEFT INTENTIONALLY BLANK]

Signed and Sealed this _____ day of _____, 20__.

Principal Name

Witness:

As to Principal

By: _____
Principal Signature [SEAL]

Surety Name

As to Surety

By: _____
Surety Signature [SEAL]

STATE OF NEW JERSEY

DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
CONSTRUCTION EEO COMPLIANCE MONITORING PROGRAM

Official Use Only

Assignment

Code

FORM AA-201

Revised 11/11

INITIAL PROJECT WORKFORCE REPORT CONSTRUCTION

For instructions on completing the form, go to: http://www.state.nj.us/treasury/contract_compliance/pdf/aa201ins.pdf

1. FID NUMBER		2. CONTRACTOR ID NUMBER				5. NAME AND ADDRESS OF PUBLIC AGENCY AWARDED CONTRACT				
						Name:				
3. NAME AND ADDRESS OF PRIME CONTRACTOR						Address:				
(Name)						CONTRACT NUMBER DATE OF AWARD DOLLAR AMOUNT OF AWARD				
(Street Address)						6. NAME AND ADDRESS OF PROJECT				
						Name:				
						Address:				
(City) (State) (Zip Code)						7. PROJECT NUMBER				
4. IS THIS COMPANY MINORITY OWNED [] OR WOMAN OWNED []		COUNTY				8. IS THIS PROJECT COVERED BY A PROJECT LABOR AGREEMENT (PLA)? YES <input type="checkbox"/>				
9. TRADE OR CRAFT	PROJECTED TOTAL EMPLOYEES				PROJECTED MINORITY EMPLOYEES				PROJECTED PHASE - IN DATE	PROJECTED COMPLETION DATE
	MALE		FEMALE		MALE		FEMALE			
	J	AP	J	AP	J	AP	J	AP		
1. ASBESTOS WORKER										
2. BRICKLAYER OR MASON										
3. CARPENTER										
4. ELECTRICIAN										
5. GLAZIER										
6. HVAC MECHANIC										
7. IRONWORKER										
8. OPERATING ENGINEER										
9. PAINTER										
10. PLUMBER										
11. ROOFER										
12. SHEET METAL WORKER										
13. SPRINKLER FITTER										
14. STEAMFITTER										
15. SURVEYOR										
16. TILER										
17. TRUCK DRIVER										
18. LABORER										
19. OTHER										
20. OTHER										

Thereby certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements are willfully false, I am subject to punishment.

(Signature)

10. (Please Print Your Name)

(Title)

(Area Code)

(Telephone Number)

(Ext.)

(Date)

INSTRUCTIONS FOR COMPLETING THE INITIAL PROJECT
WORKFORCE REPORT – CONSTRUCTION (AA201)

DO NOT COMPLETE THIS FORM FOR GOODS AND/OR SERVICE CONTRACTS

1. Enter the Federal Identification Number assigned to the contractor by the Internal Revenue Service, or if a Federal Employer Identification Number has been applied for but not yet issued, or if your business is such that you have not or will not receive a Federal Identification Number, enter the social security number assigned to the single owner or one partner, in the case of a partnership.
2. Note: The Department of Labor & Workforce Development, Construction EEO Monitoring Program will assign a contractor ID number to your company. This number will be your permanently assigned contractor ID number that must be on all correspondence and reports submitted to this office.
3. Enter the prime contractor's name, address and zip code number.
4. Check box if Company is Minority Owned or Woman Owned
5. Enter the complete name and address of the Public Agency awarding the contract. Include the contract number, date of award and dollar amount of the contract.
6. Enter the name and address of the project, including the county in which the project is located.
7. Note: A project contract ID number will be assigned to your firm upon receipt of the completed Initial Project Workforce Report (AA201) for this contract. This number must be indicated on all correspondence and reports submitted to this office relating to this contract.
8. Check "Yes" or "No" to indicate whether a Project Labor Agreement (PLA) was established with the labor organization(s) for this project.
9. Under the Projected Total Number of Employees in each trade or craft and at each level of classification, enter the total composite workforce of the prime contractor and all subcontractors projected to work on the project. Under Projected Employees enter total minority and female employees of the prime contractor and all subcontractors projected to work on the project. Minority employees include Black, Hispanic, American Indian and Asian, (J=Journeyworker, AP=Apprentice). Include projected phase-in and completion dates.
10. Print or type the name of the company official or authorized Equal Employment Opportunity (EEO) official include signature and title, phone number and date the report is submitted.

This report must be submitted to the Public Agency that awards the contract and the Department of Labor & Workforce Development, Construction EEO Compliance Monitoring Program after notification of award, but prior signing the contract.

THE CONTRACTOR IS TO RETAIN A COPY AND SUBMIT COPY TO THE PUBLIC AGENCY AWARDING
THE CONTRACT AND FORWARD A COPY TO:

NEW JERSEY DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
CONSTRUCTION EEO COMPLIANCE MONITORING UNIT

P.O. BOX 209

TRENTON, NJ 08625-0209

(609) 292-9550

DRAFT AIA[®] Document A101[™] - 2017

**Standard Form of Agreement Between Owner and Contractor
where the basis of payment is a Stipulated Sum**

AGREEMENT made as of the **00** day of **MONTH** in the year Two Thousand Twenty-Four
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Penns Grove – Carneys Point Regional School District
100 Iona Avenue
Penns Grove, New Jersey 08069

and the Contractor:
(Name, legal status, address and other information)

NAME OF CONTRACTOR
ADDRESS OF CONTRACTOR
CITY, STATE ZIP

for the following Project:
(Name, location and detailed description)

Paul W. Carleton Elementary School 2025 Pre-K Classroom Addition
251 East Maple Avenue
Penns Grove, NJ 08069

The Architect:
(Name, legal status, address and other information)

Garrison Architects
713 Creek Road
Bellmawr, New Jersey 08031

The Construction Manager:

GREYHAWK
2000 Midlantic Drive Suite 210
Mount Laurel, New Jersey 08054

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101[™]-2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201[™]-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.



ELECTRONIC COPYING of any portion of this AIA Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications and all documents referenced in the Index to the Specifications (including documents submitted with the Contractor's bid unless otherwise noted), Addenda issued prior to execution of this Agreement, all documents referenced by other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- The date of this Agreement
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

Not later than () calendar days from the date of commencement of the Work.

By the following date: **May 29, 2026 – TIME IS OF THE ESSENCE**

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates: **Completion of Phase 1 as defined in Specification Section 01010 – Summary of Work shall be by August 21, 2025.**

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor’s performance of the Contract. The Contract Sum shall be _____ Dollars (\$ _____), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates described in the Contractor’s submitted Bid Form and accepted by Owner at the time of award, if any, are included in the Contract Sum.

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. **NOT APPLICABLE**

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
A. CASH ALLOWANCE	\$150,000.00
B. SOIL REPLACEMENT ALLOWANCE: Include an allowance for 200 CY of SOIL REPLACEMENT. This allowance is calculated by taking Unit Price #1 on the Bid Form and multiplying this sum by 200 CY. Specification section “Bid Form” requires Unit Price #1 for this item, which shall include all necessary and incidental costs related to the scope of this work. Following completion of the work, a contract sum increase or decrease from the 200 CY allowance will be determined based on Unit Price #1.	\$

§ 4.4 Unit prices, if any:

Unit prices are as described in the Contractor’s submitted Bid Form.

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

The Contractor understands and agrees that all work must be performed in an orderly and closely coordinated sequence so that the dates for Substantial Completion and Final Completion are met. **TIME IS OF THE ESSENCE.**

If the Contractor fails to complete his work or fails to complete a portion of his work and therefore not achieve Substantial Completion and/or Final Completion on the respective dates required, he shall pay the Owner, as liquidated damages and not as a penalty, Two Thousand Five Hundred Dollars (\$2,500.00) per day, which is agreed upon as a reasonable and proper measure which the Owner will sustain each calendar day by failure of the Contractor to complete work within the stipulated time for the milestone dates.

The Owner will suffer significant financial loss if the project is not substantially complete on time. Liquidated Damages will be assessed if the Project is not substantially complete by the date required by the Contract Documents. The Contractor (and the Contractor's Surety) shall be liable for and pay to the Owner the sum of \$2,500.00 stipulated and fixed, agreed as liquidated damages for each calendar day of delay until the work is substantially complete.

Final Completion must be reached Thirty (30) days following the date fixed in the contract for Substantial Completion. The Contractor (and the Contractor's Surety) shall be liable for and pay to the Owner the sum of \$2,500.00 stipulated and fixed, agreed as liquidated damages for each calendar day of delay until the work is finally complete.

Substantial Completion will be determined by the Architect as defined in paragraph 9.8.1 of the General Conditions.

For damage occurring at the time of delay, the Owner may retain the amount due to him under this clause from any payments due to the Contractor.

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« N/A »

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents. An application for Payment shall include all work performed in one calendar month.

§ 5.1.2 Contractor shall electronically submit a Pencil Copy / Rough Draft of the Application for Payment to the Architect and Construction Manager for review no later than the 15 calendar days prior to the first Friday of the month payment is requested from Owner.

Architect and Construction Manager will review the Pencil Copy / Rough Draft of the Application for Payment and return to the Contractor within five (5) calendar days from their receipt of same.

§ 5.1.3 Certified Application for Payment.

.1. Within three (3) calendar days after receipt of the Pencil / Rough Draft of the Application for Payment from the Architect, the Contractor shall electronically submit the Certified Applications for Payment consistent with the Architect's markup on the Pencil / Rough Draft to the Architect for signature.

.2. The Architect shall, if finding payment for the amount submitted is appropriate under the Contract Documents, sign the Certified Application for Payment within five (5) calendar days upon receipt and electronically transmit the Certified Application for Payment to the Construction Manager by Tuesday (3 calendar days) before the first Friday of the month payment is requested from Owner.

.3 The Construction Manager shall electronically transmit the Certified Application for Payment to the Owner on the first Friday of the month payment is requested. The Construction Manager shall electronically transmit the signed Certified Application for Payment to the Contractor. (Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.3.1 The form for Applications for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA document G703 Continuation Sheets. Payroll certification for the project must be completed online at <https://njwages.nj.gov>. The Contractor will be required to submit the certified payroll via the Hub and via hard copy to Penns Grove - Carneys Point Regional Board of Education for itself and its subcontractors. The payroll records shall indicate the proper classification of employees and the payment of overtime, if any. These records shall include certified payrolls for each of Contractor's subcontractors of any tier. Payment will not be authorized if the required payroll records have not been submitted.

§ 5.1.3.2 All Applications for Payment, Certified Payroll Records and Manning Reports shall include the relevant purchase order number and project number.

§ 5.1.3.3 Pursuant to N.J.S.A. 2A:30A-1, et seq. (the "Act"), the Owner is not required to approve the Contractor's Application for Payment unless the Contractor has performed in accordance with the Contract Documents and is not required to provide approval until the next scheduled public meeting of the Board of Education following the Owner's receipt of the Architect's Certificate for Payment. Under the Act, the Owner shall not make payment to the Contractor for the payment amount until the Owner's subsequent payment cycle following its approval of the Application for Payment.

§ 5.1.3.4 Interest on amounts due pursuant to the Act shall be paid to the prime Contractor for the period beginning on the day after the required payment date and ending on the day on which the check for payment is received by the Contractor.

§ 5.1.3.5 Disputes regarding whether the Owner has failed to make payments required by the Act must be submitted to mediation unless the Owner and Contractor waive such requirement in writing at the time the dispute arises, notwithstanding anything to the contrary in the Contract Documents. The Owner and Contractor shall make a good faith effort to agree on a mediator. If the Owner and Contractor are unable to agree on a mediator, the Owner and Contractor shall each select a neutral performing service in the State of New Jersey and such neutrals shall in turn select the mediator. Owner and Contractor shall each be responsible for their own mediation costs, including one-half of the mediator's compensation. Such mediation shall apply to disputes over payments asserted to be required from Owner under the Act only and shall not apply to disputes concerning any other matters that may arise under, from or in relation to this Contract or Project. Any civil action arising under, from or in relation to this Contract or Project shall be conducted in the Superior Court for the State of New Jersey and venued in Salem County, New Jersey.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work, including those items referenced in Section 9.2.2 of AIA Document A201™-2017, General Conditions of the Contract for Construction as modified (the "A201"). The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect promptly, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with the A201, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of the A201;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of the A201; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Pursuant to N.J.S.A. 18A:18A-40.3, the Owner will withhold two percent (2%) of the amount due on each partial payment when the outstanding balance of the Contract exceeds Five Hundred Thousand Dollars (\$500,000.00), and the Owner will withhold five percent (5%) of the amount due on each partial payment when the outstanding balance of the Contract is Five Hundred Thousand Dollars (\$500,000.00) or less. Retainage shall be withheld until the Owner approves the Architect's determination that the work has been satisfactorily and finally completed and no unsettled claims exist.

§ 5.1.7.1.1 The following items are not subject to retainage: **NOT APPLICABLE**
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »
§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Final Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7.
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »
§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with the A201.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of the A201, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made as follows:

« Final payment shall be approved, if appropriate, at the next scheduled public meeting of the School Board following the provision to Owner of Architect's final Certificate of Payment. Final payment after approval shall be made during the School Board's subsequent payment cycle. »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

Zero percent (0%) except to the extent and in the amount required by N.J.S.A. 2A:30A-2(c) as to any particular payment.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of the A201, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

The method of binding dispute resolution for disputes arising out of, under or relating to this Contract or the Project shall be as follows:

(Check the appropriate box.)

- « » Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- [X] Litigation in Superior Court of New Jersey in Salem County. New Jersey law shall apply to all disputes arising out of, under or relating to this Contract or the Project without respect to the conflict of law principles thereof.
- [« »] Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of the A201.

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with the A201, then the Owner shall, after the Site and Work are secured and protected, pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

« The amount due Contractor for the Work performed through the date of termination as dictated by the schedule of values, retainage on such amounts, and such amounts as are reasonably necessary to secure and protect the Site and the Work. This shall be the Contractor’s sole compensation for termination for convenience by Owner. Timing of the payment shall be in the same manner as Final Payment under Article 5.

Under no circumstances shall Contractor be entitled to any other compensation or termination fee where Owner has terminated for convenience whether for work contemplated but not performed or for any other reason, cause, or expense.»

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of the A201.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of the A201 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

Christopher DeStratis
Penns Grove – Carneys Point Regional School District
100 Iona Avenue
Penns Grove, New Jersey 08069

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in the A201 and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in the A201 and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format may be given in accordance with the below:

« Subject to the limitations set forth in the A201 (specifically Section 1.6 thereof), notice may be given electronically to (i) the Owner, Architect or Construction Manager by the Contractor via email to: the email address for Owner's Representative in Section 8.2; the email address provided by Construction Manager following the award of the project to Contractor; **and** the email address provided by Architect following the award of the project to Contractor; and (ii) the Contractor by Owner, Architect, or Construction Manager via email to: the email address for Contractor's Representative in Section 8.3.

§ 8.7 Other provisions:

1. Payments due and unpaid under the Contract shall in no instance bear interest, except as required by law pursuant to Section 5.1.3.4 and 5.3 of this Agreement.
2. The within contract shall be governed by and interpreted pursuant to the laws of the State of New Jersey without respect to the conflict of law principles thereof.
3. The Contractor shall comply with the anti-discrimination provisions of N.J.S.A. 10:2-1, et seq., the New Jersey Law Against Discrimination, N.J.S.A. 10:5-1, et seq., and all provisions regarding equal employment opportunity, N.J.S.A. 10:5-31, et seq., N.J.A.C. 17:27-1.1, and N.J.A.C. 6A:7-1.8. The Owner and the Contractor guaranty to afford equal opportunity in the performance of this Contract in accordance with an affirmative action program approved by the State Treasurer and shall provide the documents required for this Project.
4. To perform the services provided for herein, the Contractor and its Prime Subcontractors shall be prequalified/classified by the New Jersey Department of Treasury, Division of Property, Management and Construction. The failure to possess or obtain such classifications shall result in the immediate termination of this Agreement.
5. The Contractor represents that, to the best of its knowledge, information and belief, none of its employees is engaged in conduct that constitutes a conflict of interest under, or a violation of, the School Ethics Act, N.J.S.A. 18A:12-21, et seq., and N.J.A.C. 6A:28-1.1, et seq.

6. Before final payment on the contract is made by Owner, the Contractor shall submit an accurate list and the proof of business registration in the State of New Jersey of each subcontractor or supplier used in the fulfillment of the contract or shall attest that no subcontractors were used.
7. For the term of the Agreement, the Contractor, any subcontractor and each of their affiliates, so designated pursuant to N.J.S.A. 52:32-44(g)(3), shall collect and remit to the New Jersey Director of the Division of Taxation in the Department of Treasury, the use tax due pursuant to the Sales and Use Tax Act, N.J.S.A. 52:32B-1, et seq., on all of their sales of tangible personal property delivered into the State of New Jersey, regardless of whether the tangible personal property is intended for a contract with a contracting agency. For purposes of this paragraph, "affiliate" shall mean any entity that: (a) directly, indirectly or constructively controls another entity; (b) is directly, indirectly or constructively controlled by another entity; or, (c) is subject to the control of a common entity. For purposes of the immediately preceding sentence, an entity controls another entity if it owns, directly or indirectly, more than fifty percent (50%) of the ownership interest of that entity.
8. It is the obligation of the Contractor to provide a full and complete copy of all insurance policies held by it at the Contractor's sole expense, upon reasonable request by the Owner, in the amounts specified in the Bid Documents (see Article 11 of the A201). The Contractor's failure to obtain or maintain adequate insurance coverage shall result in the immediate termination of this Agreement. The Owner will have the right to request copies of the Contractor's insurance policies or any part thereof for the duration of the contract period.
9. This Agreement and the General Conditions of the Contract as modified or supplemented in writing, shall control in the case of conflict between these documents and the Project Specifications, the Project Manual and any other exhibits incorporated by reference into this Agreement in Article 9 herein.
10. In claims against any person or entity indemnified under this Agreement by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under this Agreement shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.
11. Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety and protection of the Subcontractor's Work, which the Contractor, by the Contract Documents, assumes toward the Owner and its consultants.
12. Unpaid Lien Balance
 - a. To the fullest extent permitted by law, the Contractor shall not suffer or permit any Construction Lien (including a Construction Lien, lis pendens, or other encumbrance or cloud on title), Notice of Unpaid Balance and Right to File Lien ("NUB") or Municipal Mechanics' Lien to be filed or to remain of record as a claim against the Work or the Project or against any monies due or to become due for any work performed or services, materials or equipment furnished by to or on behalf of Contractor or any of its Subcontractors or Sub-subcontractors or any suppliers to Contractor or its Subcontractors ("Suppliers"), nor shall Contractor suffer or permit any such Construction Lien or NUB to be so filed because of any claim or demand against, or any action or non-action of the Contractor or any Subcontractors, Sub-subcontractors or Suppliers.

- b. In the event that any such Subcontractor, Sub-subcontractor or Supplier or any other party with whom the Contractor has entered into a relationship to perform any portion of the Work, files a Construction Lien and/or NUB arising out of or in connection with the Work or any work, services, material or equipment associated with this Agreement (and, as to a Municipal Mechanics' Lien, provided that Owner is not then in breach of its monetary obligation to Contractor for the work, services, material or equipment which is the subject of the Municipal Mechanics' Lien under the Contract Documents), Contractor shall within ten (10) days of receipt of notice of said Construction Lien, NUB or Municipal Mechanics' Lien cause same to be discharged, satisfied and/or bonded and, in default thereof, Owner shall have the right to bond said Construction Lien, NUB or Municipal Mechanics' Lien or otherwise discharge same (provided that Owner shall only pay and satisfy any Construction Lien, NUB or Municipal Mechanics' Lien if, within twenty (20) days from the earlier of (a) service of the lien claim on Contractor or (b) written notice from the Owner to Contractor or Subcontractor (where applicable), Contractor or Subcontractor (where applicable) has not notified Owner in writing that the claimant is not owed the monies claimed and the reason therefor, and, to retain out of any payment then due or thereafter to become due to Contractor 110% of the amount of such lien). Nothing in this paragraph shall reduce or limit Contractor's obligation to eliminate Construction Liens, NUBs or Municipal Mechanics' liens as provided elsewhere in this Paragraph 12.
- c. Should a Construction Lien, NUB and/or Municipal Mechanics' Lien be filed by a Subcontractor or Supplier of any tier or any entity or person with whom the Contractor has entered into a relationship to perform any portion of the Work (or any additional or extra work after all payments have been made to Contractor under this Agreement), and should Contractor fail to abide by the terms of this Section, Contractor shall refund to Owner all monies that the latter may be compelled to pay to bond, discharge and/or defend the Construction Lien, NUB and/or Municipal Mechanics' Lien. Any such Construction Lien and/or NUB, until satisfied, bonded off or discharged or withdrawn, shall preclude any and all claim or demand for payment whatsoever by the Contractor. The Contractor further agrees to indemnify, defend, protect and save harmless Owner and the Indemnitees from and against any and all claims, actions, fines and penalties brought or imposed or judgments rendered thereon, or any loss, damages, liability, costs and expenses, including legal fees and disbursements, which Owner may sustain or incur as a consequence of the Contractor's failure to comply with the terms of this Section. The failure of the Contractor to satisfy, discharge and/or bond a Construction Lien and/or NUB filed by a Subcontractor, Sub-subcontractor or Supplier within twenty (20) days of notice thereof shall constitute a material breach of the Contract by the Contractor.

13. In the event the Contractor fails or refuses to discharge any NUB, Construction Lien, Municipal Mechanics' Lien, (for a Municipal Mechanics' Lien, as to work for which the Contractor has been paid) within the timeframe and in the manner set forth in this Section, the Contractor shall be liable to the Owner and Indemnities for the full amount of the Municipal Mechanics' Lien, NUB or Construction Lien and all direct damages sustained by the Owner as a result thereof, as well as, all attorneys' fees and costs incurred by the Owner or any Indemnitee in connection therewith. In such event, in addition to the Owner's right to recover the foregoing damages, attorneys' fees and costs from the Contractor and in addition to all of its other common law and statutory rights, the Owner shall be entitled to: (a) declare a material breach of the Contract and terminate the Contract for default pursuant to Section 14 of the A201 and withhold payment to Contractor; (b) withhold an amount from the Contractor equal to 110 percent of the amount claimed in the NUB, Construction Lien or Municipal Mechanics' lien (c) pay the amount set forth in the NUB, Construction Lien or Municipal Mechanics' Lien and deduct this amount from amounts otherwise owed to the Contractor under the Contract; and/or (d) obtain a discharge of the NUB, Construction Lien or Municipal Mechanics' Lien, in any matter permitted under the New Jersey law, and deduct all costs incurred in connection therewith from amounts otherwise owed to the Contractor under the Contract. The foregoing remedies shall be cumulative. In exercising its rights and remedies set forth in this Section, the Owner shall not be required to present a claim in accordance with the procedure or timeframe set forth in Article 6 or the A201.
14. Assignments/ Subcontracting: The Parties agree that there will be no Assignment and/or subcontracting of this Work without prior written consent and approval of the Owner.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor and documents referenced in Article 1 of the same.
- .2 The A201.
- .3 Drawings – **SEE THE ATTACHED INDEX**
- .4 Specifications **SEE THE ATTACHED INDEX**
- .5 Addenda, if any:

Number	Date	Pages
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.6 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™-2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

The Sustainability Plan:

Supplementary and other Conditions of the Contract: **AS INCORPORATED INTO THE A201.**

.7 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™-2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Mandatory Equal Employment Opportunity Language, annexed hereto and made a part hereof

New Jersey Department of Labor and Workforce Development Prevailing Wage Rate Determination.

This Agreement entered into as of the day and year first written above.

OWNER (Signature)

« »

(Printed name and title)

CONTRACTOR (Signature)

« »

(Printed name and title)



AIA[®] Document A201[®] – 2017

General Conditions of the Contract for Construction

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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503[™], Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect.

§1.1.1.1 The Contract Documents shall include, but not be limited to advertisement or Invitation to Bid, Instructions to Bidders, the Contractor's Bid Proposal Form and other bidding forms, Addenda or portions of the Addenda relating to any Bidding Documents, Payment and performance Bonds, Certificates of Insurance, the General Terms and Conditions, Drawings and Specifications and any other documents enumerated in the Owner-Contractor Agreement. The Contract Documents shall apply to all Prime Contractors for the Project and each Prime Contractor is responsible for the content of all.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§1.1.2.1 The Contractor acknowledges and warrants that it has closely examined all of the Contract Documents; that they are suitable and sufficient to enable the Contractor to timely complete the Work for the Contract Sum; that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work and for the Work to be in full compliance with all applicable codes, laws, ordinances and regulations; and that questions regarding the bid documents and any interpretation(s) regarding same have been asked by the Contractor, in the form and manner required in the instructions to bidders.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§1.1.3.1 It is strongly encouraged for the Contractor to visit the site of the Project before submitting a bid. Such site visit shall be for the purpose of familiarizing the Contractor with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, including all existing site conditions, access to the site, physical characteristics of the site and surrounding areas. Whether or not Contractor visits the site, Contractor shall be charged with such knowledge as would have been obtainable from a thorough site visit and inspection.

§1.1.3.2 Nothing in these General Conditions shall be interpreted as imposing on either the Owner or Architect, or their respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed project, including but not limited to shoring, scaffolding, hoists, temporary weatherproofing, or any temporary facility or temporary activity, since these are the sole responsibility of the Contractor.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.5.1 The Drawings are diagrammatical and show the general arrangement and extent of the Work; exact locations and arrangements of parts shall be determined as the Work progresses, shall be subject to the Architect's approval, and shall not result in the extension of the Contract Time or additional compensation.

.1 The right is reserved by the Architect to make any reasonable change in location of equipment, ductwork, and piping prior to roughing in without involving additional expense to the Owner or extensions of Contract Time.

.2 Contractor shall coordinate his Work with the Work of others and shall be responsible for the coordination work, so that interference between mechanical, electrical, architectural, structural and other work does not occur.

.3 Contractor shall furnish and install supports, hangers, offsets, bends, turns, and the like in connection with this Work to avoid interference with work of other Contractors, to conceal Work where required, and to secure necessary clearance and access for operation and maintenance without involving additional expense to the Owner or extensions of Contract Time.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services which include the Instructions to Bidders, the Advertisement and forms required at the time of and after the receipt of the bids.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith. The Architect shall be the Initial Decision Maker.

§ 1.1.9 Knowledge

Knowledge. The terms "knowledge," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the care, skill, and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor generally familiar with the Project, the type of construction work required, and the circumstances attendant to the Project site and by a Contractor exercising the care, skill, and diligence required of the Contractor by the Contract Documents.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The Contract Documents include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary or useful to produce the indicated results.

§ 1.2.1.1 The general character of the detail work is shown on the drawings, but minor modifications may be made in large scale details. Where the word "similar" occurs on the drawings it shall be used in its general sense and not as meaning identical, and all details shall be worked out by Contractor, consistent with the requirements of the Contract Documents, in relation to their location and their connection to other parts of the work.

- .1 Where on any drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to other like portions of the work.
- .2 Where detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts in the work unless otherwise indicated.
- .3 In case of differences between small and large-scale drawings, the larger scale drawings shall take precedence. Dimensions given shall take precedence over scale measurements.
- .4 Any discrepancies or questions as to the application of, and interpretations related to 1.2.1.1, shall be referred to the Architect for adjustment before any work affected thereby has been performed.

§1.2.1.2 During the course of the work, should any ambiguities or discrepancies be found in the Specifications or on the Drawings; or should there be found any discrepancies between the Drawings and Specifications to which the Contractor has failed to call attention before submitting his bid, then the Architect will interpret the intent of the Drawings and Specifications; and the Contractor hereby agrees to abide by the Architect's interpretation and to carry out the work in accordance with the decision of the Architect.

§1.2.1.3 It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Architect may interpret or construe the Drawings and Specifications so as to secure in all cases the result most consistent with the needs and requirements of the work. In the event of such ambiguity or discrepancy subject to any Architect's interpretation, the Contractor shall comply with the more stringent requirement, and supply the better quality or greater quantity of work.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§1.2.2.1 The various materials and products specified in the specifications by name or description are given to establish a standard of quality and of cost for bid purposes. It is not the intent to limit the acceptance to any one material or product specified, but rather to name or describe it as the absolute minimum standard that is desired and acceptable, all determinations as to equality of a proposed product or material shall be at the discretion of the Architect and/or the Owner.

- .1 A material or product of lesser quality will not be acceptable.
- .2 Where "Basis of Design" products or manufacturer's names are used, whether or not followed by the words "or approved equal," they shall be subject to approved equals and authorized only by the Architect and/or the Owner.
- .3 Insofar as practicable, except as otherwise specified or shown, the material or product of one manufacturer shall be used throughout the work for each specified purpose.

§1.2.2.2 Substitutions lowering performance, quality, method of assembly or installation, or in general not in keeping with details and specifications, will not be permitted. Refer to substitution procedure indicated elsewhere in the Contract Documents.

§1.2.2.3 It is understood when a bid for any product or material is submitted, the Contractor is aware of specified requirements and all materials or products within its bid are equal or better than such specified items. The Contractor is aware that any pricing decisions utilizing substitutes are at Contractor's own risk that the Architect and/or the Owner will find the substitutes not equal or better than the specified items; in such cases the Contractor shall use the specified items or seek approval of different products asserted to be equal to or better than the specified items. In no event shall Contractor's requests to use substitutes delay Contractor's performance or entitle Contractor to an extension of the Contract Time.

§1.2.2.4 In addition to the Specifications, it shall be understood that details on Drawings shall become part of the Specification in determining the required "standard of quality."

§1.2.2.5 If a conflict occurs between Drawing details and Specifications, bidder during bidding process and/or Contractor shall bring such conflicts to the attention of the Architect in accordance with applicable requirements indicated elsewhere in other sections of Contract Documents.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined in this document or the Agreement, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants. Drawings, specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service for use solely with respect to this Project, except that Owner shall be authorized to use any Instruments of Service for future maintenance or repair of or additions or alterations to this Project or for other Projects. The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service and shall retain all common law, statutory and other reserved rights, including copyrights.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement. All notices to Owner, Architect or Construction Manager shall be provided to each of the Owner, Architect and Construction Manager.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery. In addition, Notices of Claims shall also be provided by electronic transmission.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form.

§ 1.8 INTENTIONALLY OMITTED

§ 1.9 EXECUTION OF CONTRACT DOCUMENTS

§ 1.9.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request. Execution of the Agreement and performance thereunder by Contractor shall constitute Contractor's acceptance of all unsigned Contract Documents as if they were fully executed, but this shall not impact Contractor's obligation to sign such documents. The Agreement shall be signed in not less than triplicate by the Owner and Contractor.

§ 1.9.2 Submission of a bid by the Contractor is a representation that said Contract Documents are full and complete, are sufficient to have enabled the Contractor to determine the cost of the Work therein and to enter into the Contract and that the Contract Documents are sufficient to enable it to construct the Work outlined therein, and otherwise to fulfill all its obligations hereunder, including, but not limited to, Contractor's obligation to construct the Work for an amount not in excess of the Contract Sum on or before the date(s) of Substantial Completion and Final Completion established in the Agreement. The Contractor further acknowledges and declares that it has visited and examined the site, examined all physical, legal, and other conditions affecting the Work and is fully familiar with all of the conditions thereon and thereunder affecting the same. In connection therewith, Contractor specifically represents and warrants to Owner that it has, by careful examination, satisfied itself as to: (1) the nature, location and character of the Project and the site, including, without limitation, the surface and subsurface conditions of the site and all structures and obstructions thereon and thereunder, both natural and man-made, and all surface and subsurface water conditions of the site and the surrounding area; (2) the nature, location, and character of the general area in which the Project is located, including without limitation, its climatic conditions, available labor supply and labor costs, and available equipment supply and equipment costs; (3) the quality and quantity of all materials, supplies, tools, equipment, labor, and professional services necessary to complete the Work in the manner and within the cost and time frame required by the Contract Documents; and (4) the condition of existing and planned structures on the site and the ability, safety and appropriateness of same to receive the Work in the manner required by the Contract Documents. The potential that such physical, practical and intangible conditions are not as understood by Contractor at the time of its bid or that such physical, practical and intangible conditions may change during the course of performance, and the costs associated with such potential, are risks borne and accepted by Contractor. In connection with the foregoing and the remainder of the Contract Documents, and having carefully examined all Contract Documents, as aforesaid, and having visited the site, the contractor acknowledges and declares that it has no knowledge of any discrepancies, errors, omissions, ambiguities, or conflicts in said Contract Documents, has correlated its personal observations with the requirements of the Contract Documents, and that if it becomes aware of any discrepancies, errors, omissions, ambiguities, or conflicts, it will promptly notify Owner and Architect of such fact. The Contractor shall not be entitled to additional compensation or an extension of the Contract Time as a result of any of the foregoing.

§ 1.9.3 Any differences between the requirements of the Drawings and the Specifications or any differences noted within the Drawings themselves or within the Specifications themselves have been referred to the Owner and Architect by Contractor prior to the submission of bids and have been clarified by an Addendum issued to all bidders. The failure of a Contractor to provide notice of such a conflict prior to the question deadline in the Notice to Bidders shall constitute an absolute bar to the assertion of a claim based on the presence such conflict.

1.9.3.1 To "provide" work means to furnish and install, complete, in place and ready for use.

1.9.3.2 The Contractor shall request, from the Architect/Engineer's interpretation of apparent discrepancies, errors, conflicts, or omissions in the Specifications and Drawings. Subcontractors shall forward such requests through the Contractor. Such requests, and the Architect/Engineer's interpretation, shall be in written form; other forms of communications shall be used to expedite resolution of concerns, but will not be binding.

§1.9.3.3 Explanatory notes shall take precedence over conflicting drawn note indications.

§1.9.4 When more than one material, brand, or process is specified for a particular item of Work, the choice shall be the Contractor's. Contractor shall, after notifying the Architect and Owner, select the one it considers to be the best. Approval by Architect or Owner of materials, suppliers, processes, or Subcontractors does not imply a waiver of any Contract requirements including, without limitation, Contractor's warranty.

§1.9.5 In all cases, the details, drawings, and specifications shall be checked with existing conditions and with work in place, and variations, if any, shall be referred by the Contractor to the Architect for adjustment, as the Contractor will be responsible for the fit or work in place.

§1.9.6 When a profile, section or other finished condition is shown, furring or other method of obtaining such finished conditions shall be provided.

§1.9.7 Where it is required in the specifications that materials, products, processes, equipment, or the like be installed or applied in accordance with manufacturers' instructions, directions, or specifications, or words to this effect, it shall be construed to mean that said application or installation shall be in strict accordance with printed material concerned for use under conditions similar to those at the job site. Three copies of such instructions shall be furnished to the Architect and his written approval thereof obtained before work is begun. If there is any variance between the manufacturers' instructions, directions or specifications and the Specifications, the Contractor shall seek clarification from the Architect.

§1.9.8 Any material specified by reference to the number, symbol, or title of a Commercial Standard, Federal Specification, ASTM Specification, trade association standard, or other similar standards, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect one month prior to the date on which bids are opened and read, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in the specifications. The Architect will furnish upon request information as to how copies of the standards referred to may be obtained.

§1.9.9 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute the Owner-Contractor Agreement, which representations and warranties shall survive the execution and delivery of the Owner-Contractor Agreement and the final completion of the Work

- .1 that it is authorized to do business in the State, County, and / or City where construction will take place at the Project and is properly licensed by all necessary governmental and public authorities having jurisdiction over it and over the Work and the site of the Project;
- .2 that it is familiar with all Federal, State, Municipal and Owner laws, ordinances and regulations, which may in any way affect the work of those employed herein, including but not limited to any special acts relating to the work or to the project of which it is a part;
- .3 that such temporary and permanent work required by the Contract Documents as is to be done by it, can be satisfactorily constructed and used for the purposes for which it is intended;
- .4 that it is familiar with local trade jurisdictional practices at the site of the project;
- .5 that it has carefully examined the plans; the specifications and the site of the work, and that from his own investigations, it has satisfied itself as to the nature and location of the work, the character, quality and quantity of the surface and subsurface materials to be encountered, the character of equipment and other facilities needed for the performance of the work, and the general local conditions, and all other materials which may in any way affect the work or his/her performance;
- .6 that it has determined what local ordinances, if any, will affect his work. It has checked for any County, City, Borough, or Township rules or regulations applicable to the area in which the Project is being constructed and in addition, for any rules or regulations of other organizations having jurisdiction, such as chambers-of-commerce, planning commission, industries, or utility companies who have jurisdiction over property on which the Work will be performed. Any costs of compliance with local controls are included in the prices bid, even if documents of such local controlling agencies are not listed specifically in the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as

otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INTENTIONALLY OMITTED

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely only on the accuracy of the legal limitations furnished by the Owner and shall exercise proper precautions relating to the safe performance of the Work. The furnishing of these surveys and the legal description of the site shall not relieve the Contractor from its duties under the Contract Documents. Neither Owner nor the Architect shall be required to furnish Contractor with any information concerning subsurface characteristics, utilities or conditions of the areas where the Work is to be performed or concerning the structures on/in which the Work is to be performed. When the Owner or Architect has made investigations of subsurface characteristics or conditions of the areas where the Work is to be performed or concerning the structures on/in which the Work is to be performed, such investigations, if any, were made solely for the purposes of Owner's study and Architect's design. Neither such investigations nor the records thereof are a part of the Contract between Owner and Contractor. To the extent such investigations or the records thereof are made available to Contractor by the Owner or Architect, such information is furnished solely for the convenience of Contractor. Neither Owner nor Architect assumes any responsibility whatsoever in respect of the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Owner or Architect in its use thereof, and there is no warranty or guaranty, either express or implied, that the conditions indicated by such investigations or records thereof are accurate or that the indicated conditions are representative of those existing throughout the areas or structures where the Work is to be performed, or any part thereof, or that unforeseen developments may not occur, or that materials other than or in proportions different from those indicated may not be encountered. The Contractor shall undertake such further investigations and studies as may be necessary or useful to determine subsurface characteristics and conditions. In connection with the foregoing, Contractor shall be solely responsible for locating (and shall locate prior to performing any Work) all utility lines, telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2 and 1.5.3.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the Work within the Contract Time or fails to remove and discharge (within ten days) any lien filed upon Owner's property or funds by anyone claiming by, through, or under Contractor, disregards the instructions of Architect or Owner when based on the requirements of the Contract Documents or otherwise violates any terms and conditions of the Contract Documents the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

§ 2.4.1 Notwithstanding anything else in the Contract Documents, the Owner shall have the authority to immediately correct, service, repair, replace or otherwise make operational any component of their facilities including equipment if in the sole discretion of the owner the damaged component is a threat to education, safety or security. The Owner is obligated to put the Contractor on notice of the issue threatening education, safety or security, and the Owner's intent to remedy immediately with other resources and to back charge the Contractor for the cost of said service, but there is no obligation to provide Contractor an opportunity to cure required for corrective actions necessary to protect the Owner's interest in education, safety and security.

§ 2.5 Owner's Right to Carry Out the Work

§ 2.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and (i) fails within a seven-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness or (ii) Owner and Architect reasonably believe that such correction cannot be properly completed within a seven-day period, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's and Construction Manager's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor and/or its Surety shall pay the difference to the Owner.

§ 2.5.2 The Owner's rights and remedies stated in Sections 2.4, 2.5 and elsewhere in the Contract Documents are cumulative and not in limitation of any other rights or remedies of the Owner (i) granted in the Contract Documents; (ii) at law; or (iii) in equity.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. The Contractor is responsible for supervisory control over and allocation and coordination of all Subcontractors and trades, performance and completion of all portions of the Work, including cooperation with those doing portions of the Project under Separate Contracts with the Owner.

§ 3.1.2 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.3 Standard of Care: The Contractor shall exercise the highest and best skill, judgment, and care of a contractor performing work of the type required by the Contract Documents. Contractor acknowledges that this provision requires that it perform with more than a mere "reasonable" standard of care.

§ 3.2 Requests for Information; Field Conditions

§ 3.2.1 If the Contractor requires clarification of the intent of the Contract Documents after award, the Contractor shall be responsible to issue a typewritten request for information (RFI) to the Architect and Construction Manager utilizing the Architect or Construction Manager's sample form via acceptable methods set forth in Article 4.2.

All RFI's shall clearly identify the Architect's project number, the construction company's name, author's name, date issued, address, phone numbers, facsimile number and the addressee of the communication.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. The Contractor shall satisfy itself as to the accuracy of all dimensions and locations. In all cases of interconnection of its work with existing or other work, it shall verify at the site, all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to verify all such locations or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. If the Contractor performs any construction activity involving an error, inconsistency, legal nonconformity, or omission in the Contract Documents that the Contractor was obliged to recognize pursuant to the terms of the Contract Documents, the Contractor shall assume complete responsibility for such performance and shall bear the full amount of the attributable costs for correction and any damages to Owner, Architect, Construction Manager, or Separate Contractors arising from that work.

§ 3.2.2.1 Contractor acknowledges, The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedures, and techniques necessary to perform the Work, use of materials, selection of equipment, and requirements of products by manufacturers are consistent with;

- .1 the highest and best skill, judgment, and care within the construction industry and applicable to the Work;
- .2 requirements of any warranties applicable to the Work; and
- .3 all laws, ordinances, regulations, rules, and orders which bear upon the Contractor's performance of the Work.

§ 3.2.2.2 The Contract Sum is firm and all inclusive, and no escalation is contemplated for any reason whatsoever. The Contract Sum includes any and all costs associated with substantial and final completion by the dates and times specified, including any and all costs associated with out-of-sequence work, come-back work, stand-by work, stacking of trades, coordination with the schedules and work of Separate Contractors, allowing sufficient time, work and storage areas, and site access for Separate Contractors to timely progress and complete their work, overtime, expediting and acceleration that may be required to complete the work by those dates and times.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly provide notice to the Architect of any legal nonconformity discovered by or made known to the Contractor.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information, the Contractor shall submit Claims as provided in Article 15.

§ 3.2.5 Typographical and spelling errors will be interpreted by the Architect for their intended meaning and the interpretations of the Architect shall be final and binding.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences, or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor, when requested by the Architect or Construction Manager, shall meet with representative of the Architect or Construction Manager at all times and furnish all information requested; it shall allow the Architect and Construction Manager to inspect the work at all times. Neither the Owner, nor the Architect or Construction Manager shall be liable to the Contractor for extra compensation or damages for interference or delays on account of any such meetings, information, or inspections so requested or other acts of the Architect or Construction Manager done in good faith and within the scope of their employment by the Owner.

§ 3.3.5 The Contractor has the responsibility to ensure that all material suppliers and Subcontractors, their agents, and employees adhere to the Contract Documents, and that they order materials on time, taking into account the current and potential market and delivery conditions and that they provide materials on time. The Contractor is aware of the presence of market volatility and potentiality for significant delivery delays and has assumed the risk of same. The Contractor shall coordinate its Work with that of all others on the Project including deliveries, storage, installations, and construction utilities. The Contractor shall be responsible for the space requirements, locations, and routing of its equipment. In areas and locations where the proper and most effective space requirements, locations and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation.

§ 3.3.6 The Contractor shall establish and maintain benchmarks and all other grades, lines, and levels necessary for the Work and review the placement of the building(s) and permanent facilities on the site with the Owner and Architect after all lines are staked out and before foundation Work is started. Contractor shall provide access to the Work for the Owner, the Architect, other persons designated by Owner, and governmental inspectors. Any encroachments made by Contractor or its Subcontractor (of any tier) on adjacent properties due to construction as revealed by an improvement survey, except for encroachments arising from errors or omissions not reasonably discoverable by Contractor in the Contract Documents, shall be the sole responsibility of the Contractor, and Contractor shall correct such encroachments within thirty (30) days of the improvement survey (or as soon thereafter as reasonably possible), at Contractor's sole cost and expense, either by the removal of the encroachment (and subsequent reconstruction on the Project site) or agreement with the adjacent property owner(s) (in form and substance satisfactory to Owner in its sole discretion) allowing the encroachments to remain.

§3.3.6.1 Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance.

.1 If the Work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner and without recourse to the Engineer or the Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the work of any particular trade.

.2 In case the progress of the Work is affected by any undue delay in furnishing or installing any items or materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

§ 3.3.7 Coordination:

1. The Contractor is the sole responsible party for the coordination of the entire project.
2. The Contractor shall be responsible to coordinate and expedite the total construction process and all of its parts. The Owner relies upon the organization, management, skill, cooperation and efficiency of the Contractor to supervise, direct, control and manage the work and to coordinate and expedite the efforts of Separate Contractors and subcontractors so as to deliver the Work conforming to the contract within the scheduled time. The Contractor is responsible for proper sequence and coordination. It shall determine the location of work and attempt to resolve conflicts amongst itself and Separate Contractors and subcontractors.
3. The Owner has hired a CONSTRUCTION MANAGER to provide on-site Project Management services. The Construction Manager and the Architect will share administrative duties, which will be delineated at the Pre-construction conference. The Construction Manager will essentially be the liaison between Owner, Architect, Contractor and Separate Contractors deferring to the Contractor and Separate Contractors for means and methods, deferring to the Architect for final clarifications and determinations of disputes, design issues, and aesthetics and ensuring Owner's voice and interests are represented as the Project proceeds. The Construction Manager, along with the Architect, will manage the following processes – shop drawings, change orders, payments, correspondence, RFI's, construction schedules, documentation, job meetings, quality assurance, punchlists, etc.
4. The Contractor shall provide a qualified full-time staff member or members to manage the project. THIS PROJECT MANAGER shall coordinate, organize and manage the project from the Contractor's main office and oversee the shop drawing process signing off for quality assurance and conformance with the Contract Documents on each shop drawing. The Project Manager shall be subject to the approval of the Owner, Construction Manager and Architect who at all times have the right to require the Contractor to replace this Project Manager if their performance is not reasonably satisfactory. The Project Manager shall conduct an onsite meeting at least once a week with the construction superintendent and all Separate Contractors and/or subcontractors in attendance to coordinate the project and review the schedule. The Construction Manager will attend but is not responsible for organizing or taking minutes. The Project Manager shall provide a meeting agenda and issue minutes within four (4) working days of each meeting.
5. The Contractor shall provide a qualified full-time staff member or members to manage the project on site. THIS CONSTRUCTION SUPERINTENDENT and their assistants shall coordinate, organize and manage the project from the Contractor's on-site field office and oversee Contractor's own work and the work of its subcontractors. Should the Contractor be responsible for multiple projects at different sites, multiple locations on one large site or a multiple-site project under one contract then the Contractor shall provide a separate qualified Construction Superintendent for each of the projects or locations. This determination shall be made by Owner, Construction Manager and Architect who at all times may require additional manpower. The Construction Superintendent shall be responsible for onsite safety, quality assurance, conformance with the Contract Documents and perform coordination with all on site construction personnel and/or subcontractors. The Construction Superintendent and their assistants shall be subject to the approval of the Owner, Construction Manager and Architect, who at all times have the right to require the Contractor to replace this Construction Superintendent and any assistant if their performance is not reasonably satisfactory
6. Contractor's Subcontractors shall also have a designated superintendent and/or foreman who will at all times be subject to the approval of the Owner, Construction Manager and Architect. The Owner, Construction Manager and Architect reserves the right to require the Contractor to replace the superintendent and/or foreman if their performance is not reasonably satisfactory; Contractor's Subcontractors shall be required to consent to same under the terms of their subcontracts.
7. Each Subcontractor shall coordinate its activities with the activities of Contractor, Separate Contractors and other subcontractors.
8. All questions pertaining to the Work are to be made, via request for information, to the Architect sufficiently in advance of performance to permit Architect time to thoroughly evaluate and investigate the request and provide a written response without delaying the progress of the Work. Contractor shall be

- responsible for any delay occasioned by the failure to timely submit a request for information based on the standard in this paragraph.
9. The Contractor is required to submit a site logistics plan coordinating all Owner and Construction Manager functions with the access and safety of the job site.
 10. The Contractor is required to coordinate all the inspection and material testing to meet the Contract Documents requirements.
 11. The Contractor has full and sole responsibility for construction methods and implementation of a "quality control system" to insure coordination.
 12. The Contractor shall make all necessary arrangements to conduct work so that all parts shall be carried on harmoniously and simultaneously or sequentially, so as components or increments of the same shall not interfere or retard the progress of others.
 13. The Contractor shall coordinate the delivery, unloading, movement, relocation, storage and protection of all materials.
 14. Accurate dimensions, sleeved and opening drawings are to be submitted by Contractor to Architect prior to placement in the field.
 15. The Contractor shall prepare coordination drawings for all above ceiling areas throughout the entire project. Such drawings shall show all piping, duct, cable trays, electrical duct banks, similar items (but not electrical conduit less than 4 inches in diameter), and complete architectural, mechanical and electrical reflected ceiling layouts, (including ductwork, conduits, piping, lighting, etc.).
 16. The Contractor is responsible for any omissions of the Subcontractors and is required to provide a complete operating facility.
 17. The Contractor shall be responsible for preserving the integrity of ceiling heights and room sizes and shall:
 - a. Check compatibility with equipment, other work, electrical characteristics, and operational control requirements; check motor voltages and control characteristics; coordinate controls, interlocks, wiring of pneumatic switches, and relays; coordinate wiring and control wiring diagrams; review the effect of changes on other work; and obtain and distribute installation data on each item of equipment requiring mechanical or electrical connections;
 - b. Coordinate and observe start-up and demonstration of equipment and systems; observe and maintain records of tests and inspections; and coordinate maintenance of record documents;
 - c. Assist the Construction Manager and any of Construction Manager, Architect, or Owner's consultants with final inspections.
 - d. Inform the Owner via the Construction Manager when coordination of Owner's work is required;
 - e. Coordinate all mechanical, plumbing, electrical, food service and equipment/furnishings work, and coordinate that work with all other work.
 18. Where space is limited, Contractor shall show plan and cross-section dimensions of space available, including structural obstructions and ceilings as applicable.
 19. Contractor shall coordinate cutting and patching activities and sequencing with Separate Contractors and subcontractors.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive and the provisions of Section 01300 of the Contract Specifications.

§ 3.4.2.1 The Architect will evaluate alternatives and substitutions and shall be the sole judge of whether the alternatives and substitutions are acceptable.

- .1 The burden of proving the alternatives and substitutions are equal to or better than the specified product is that of the Contractor.
- .2 Contractor shall submit request for substitution in accordance with substitution procedures indicated elsewhere in the Contract Documents.
- .3 Products which do not meet the specifications will not be accepted.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor must provide suitable storage facilities at the site for the proper protection and safe storage of his materials. Such storage facilities must be approved in advance in writing by the Architect.

§ 3.4.5 All materials delivered to the premises which are to form a part of the work are to be considered the property of the Owner and must not be removed without the Architect's consent; but the Contractor shall remove all surplus materials upon completion of each phase of the work and as directed by the Architect.

§ 3.4.6 When any room is used as a shop, storeroom, etc., during the progress of the work, the Contractor making use of the space will be responsible for any repairs, patching, or cleaning arising from such use. Prior approval of the Construction Manager or Architect for use of such areas is mandatory.

§ 3.4.7 Not later than seven (7) days from the execution of the Agreement, the Contractor shall provide a list showing the name of the manufacturer proposed to be used for each of the products identified in the Specifications Divisions 1-16, and if applicable, the installing Subcontractor's name.

§ 3.4.8 The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the locale of the Project, including, but not limited to, trade jurisdictions and agreements, incentive and premium time, pay, procurement, living and commuting conditions. Contractor shall assume responsibility for costs resulting from his failure to verify conditions affecting his labor.

§ 3.4.9 Except as specifically provided in Subparagraph 8.3.1, Contractor shall be liable to Owner for all damages suffered by Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work shall conform to the requirements of the Contract Documents and shall be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This Section shall not shorten or limit the manufacturer's warranties in any way.

§ 3.5.2 The Contractor represents that all manufacturer and supplier warranties shall run directly to or be specifically assignable to the Owner. The Contractor warrants that all portions of the work that will be covered by a manufacturer or supplier's warranty shall be performed in such a manner so as to preserve all rights under such warranties. All such warranties shall commence in accordance with Section 9.8.4, Substantial Completion. The Contractor hereby assigns to the Owner, effective upon the earlier of termination of this contract or substantial completion, all manufacturer and supplier's warranties relating to the Work, and the Contractor shall upon request of the Owner, execute any document reasonably requested by Owner to effectuate such assignment. If the Owner attempts to enforce a claim based upon a manufacturer or supplier's warranty and such manufacturer or supplier refuses to honor such warranty based in whole or in part on a claim of defective installation by the Contractor, the Contractor shall be responsible for any resulting loss or damages incurred by the Owner as a result of the manufacturer or supplier's refusal to honor such warranty. The Contractor's obligations under this Section 3.5.2 shall survive the expiration or earlier termination of the Contract. The warranty period for all work of each Contractor shall be two (2) years from the date of final inspection and acceptance by the Owner unless otherwise specified.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.1 The owner is exempt from all taxes including Federal Excise Tax, fuel tax, transportation taxes and State Sales or Use Tax.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 The Contractor shall be required to secure permits or government approvals necessary for the proper execution and completion of the work. The Contractor shall obtain business licenses required by the State, County and/or City/Township and shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work.

§ 3.7.1.1 The required Building Permit or Permits shall be secured by the Contractor for the entire project. This shall include permits required for the Construction Manager's Trailer.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 In addition to any other obligation under similar provisions of the Contract Documents, if the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear all costs attributable to the correction thereof or related thereto, including all fines and penalties.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than three (3) days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially shall direct any necessary re-design of the Work. As set forth in Article 1, Contractor accepts the risk of concealed or unknown conditions.

§3.7.4.1 If it shall be determined by a court of competent jurisdiction that Contractor cannot bear the full risk of concealed or unknown conditions as a matter of law, adjustment in the Contract Time or Contract Sum shall be permitted only for conditions that differ materially from those conditions specifically disclosed by Owner, Architect, or Construction Manager or unusual and adverse conditions actually known to Owner, Architect, or Construction Manager that should have reasonably been disclosed to Contractor.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features.

§ 3.8 Allowances (See Specification "Section 01210 – Allowances")

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and all required taxes, less applicable trade discounts;
- .2 whenever costs of materials and equipment are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual costs of material and equipment and the allowances under Section 3.8.2.1, but shall not reflect changes in the costs for unloading and handling at the site, labor, or installation costs.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Construction Superintendent shall represent the Contractor, and communications given to the Construction Superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed Construction Superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed Construction Superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed Construction Superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the Construction Superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule prepared by the Contractor shall indicate the proposed starting and completion date for the various subdivisions of the Work as well as the totality of the Work. The schedule shall be updated every thirty (30) days and must be submitted to the Architect with Contractor's Applications for Payment. If the schedule is not submitted with the payment application, no payment will be processed. Each schedule shall contain a comparison of actual progress with the estimated progress for such point in time started in the original schedule. If any schedule submitted sets forth a date for Substantial Completion for the Work or any phase of the Work beyond the Date(s) of Substantial Completion established in the Contract (as the same may be extended as provided in the Contract Documents), then Contractor shall submit to Architect and Owner for their review and approval an explanation for the cause of the schedule slippage and a description of the means and methods which Contractor intends to employ to expedite the progress of the Work to ensure timely completion of the various phases of the Work as well as the totality of the Work. To ensure such timely completion, Contractor shall take all necessary action including, without limitation, increasing the number of personnel and labor on the Project and implementing overtime and double shifts. In that event, Contractor shall not be entitled to an adjustment in the Contract Sum or the schedule. Upon request and demand by Architect/Owner, Contractor shall provide a recovery schedule in accordance with the Specifications.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 Schedules shall comply with the requirements of the Division 1 "Section 01040 - Project Coordination," and Section 01310 - "Construction Progress Documentation. The Schedule shall also (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates").

§ 3.10.5 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working Additional shifts or overtime, (ii) supplying Additional manpower, equipment, and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

- .1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subsection 3.10.5.
- .2 The Owner may exercise the rights furnished the Owner under or pursuant to this Subsection 3.10.5 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.
- .3 The Owner's failure to direct Extraordinary Measures shall in no event excuse Contractor's failure to maintain the schedule or timely reach substantial or final completion of the Work.

§ 3.10.6 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Subsection 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Subsection 8.3.1, and an equitable adjustment in the Contract Sum if (i) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, (ii) Contractor was on schedule to timely reach substantial and final completion of the Work; and (iii) such rescheduling or postponement is required for the convenience of the Owner.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Owner upon completion of the Work as a record of the Work as constructed. See Specification "Section 01300 - Submittals," and "Section 01700 - Project Closeout," for specific details and requirements.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 Detailed requirements are specified in Specification "Section 01300 - Submittals."

§ 3.12.12 All shop drawings are to include manufacturer's data. All shop drawings and samples are to be submitted by the Contractor to the Architect for review. Each sheet of the shop drawings shall identify the project, contractor, subcontractor, fabricator or manufacturer and the date of the drawings. All shop drawings shall be numbered in consecutive sequence and each sheet shall indicate the total number of sheets in the set.

§ 3.12.13 Substitutions: All substitutions or deviations from plans and specification must be clearly noted as such on all shop drawings. Contractor shall identify, coordinate and pay for any additional requirements as a result of substitutions, deviations, etc., including necessary change orders. In addition, substitution submittals shall be made no later than 30 days after the execution of the Agreement in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.1 Location and weights of all equipment and materials and the Contractor intends to place on the slab shall be submitted to the Architect for review.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner with the exception of those directed to be erected through the Contract Documents and those necessary for site safety or in an emergency.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the Building in the event of partial occupancy, as more specifically described in Paragraph 9.9.

§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including without limitation, lavatories, toilets, entrances and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time.

The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such and suggest alternatives through which the same results can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirement of the rules and regulations. The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

§3.13.6 The Contractor shall provide a temporary construction fence whether shown on the contract documents or not as required to separate the area or areas under construction from the Owners area or areas used by the public. The temporary fencing shall be approved by the Owner prior to installation. The fence shall be 6' high and have vinyl privacy fabric obstructing views into the construction area.

§ 3.14 Cutting and Patching (See Specification "Section 01045 – Cutting and Patching")

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 The Contractor shall perform all daily clean up and removal of debris from the site including that of its Subcontractors. The Contractor shall maintain an adequate supply of laborers to accomplish daily clean up and removal of debris from the site and work areas. No debris will be allowed to accumulate in or around the building including masonry debris. The building site must be maintained free of all litter, dirt, dust and debris on a daily basis. The Owner, Architect or Construction Manager may stop all work and require all personnel on site to clean up. No accumulation of flammable material is permitted. Prior to installation of finishes, the floors will be swept or vacuumed and kept free of dust and dirt until turned over to the Owner. Contractor shall immediately notify Architect, Owner and Construction Manager in the event of snow and or ice accumulation in the site which can reasonably affect safety.

§ 3.15.4 Cleaning and debris removal may be considered a safety concern by judgment of the Owner, Construction Manager or Architect and as such the work may be stopped to provide time and labor for immediate clean up.

§ 3.15.5 Final Clean-Up: The Contractor has the responsibility for the final clean-up and policing of the entire site after Separate Contractors have removed their own waste materials, rubbish, equipment, tools and plant. In addition, thereto, the Contractor shall have a professional cleaning company perform the following immediately prior to the Architect's inspection for Substantial Completion:

- .1 Removal of all manufacturer's temporary labels from materials, equipment and fixtures.
- .2 Removal of all stains from glass and mirrors; wash, polish, inside and outside.
- .3 Removal of marks, stains, fingerprints, other soil, dust, dirt, from painted, decorated, or stained woodwork, plaster or plasterboard, metal, acoustic tile, and equipment surfaces.
- .4 Remove spots, paint, soil, from resilient flooring.
- .5 Remove temporary floor protections; clean, strip and provide three (3) coats of wax on new VCT floors or otherwise treat as directed by the material manufacturer's recommendation, all finished floors. Final vacuum all carpet.
- .6 Clean all interior finished surfaces, including doors and window frames, and hardware required to have a polished finish, of oil, stains, dust, dirt, paint, and the like; leave without fingerprints, blemishes.
- .7 Final site clean-up shall extend beyond the Contract Limit Lines as reasonably required to ensure the complete removal of all construction debris from the entire site, including staging areas.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager and Architect with access to the Work in preparation and progress wherever located.

§ 3.16.1 The Contractor shall promptly notify the Architect, Construction Manager and Owner of the presence of hazardous conditions at the site, including the start of hazardous operations or the discovery or exposure of hazardous substances.

§ 3.16.2 Contractor shall be responsible for snow plowing and snow removal as required to maintain ingress to, egress from and mobility around construction areas.

§ 3.16.3 Contractor shall keep only necessary equipment on site and shall cooperate with the Owner regarding location of stored material.

§ 3.16.4 The Contractor is to maintain reasonable access to site for structural steel erection including crane, steel deliveries, etc. The Contractor will be responsible to coordinate requirements with the Construction Manager a minimum of 21 days prior to deliveries.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, Architect, Construction Manager, and other consultants or professionals retained by Owner and their respective officers, employees, owners, volunteers and agents ("Indemnitees"), from and against all claims, damages, losses, and expenses, including reasonable attorney's fees and costs, in case it shall be necessary to file an action or claim or in case an action or claim is brought or made which is; 1) for personal or bodily injury, illness or death, for property damage, including loss of use, or for any economic loss and; 2) caused in whole or in part by Contractor's alleged negligent acts or omissions, breaches of contract, or otherwise arising out of their work, or those of a Subcontractor, or that of anyone employed by them, or for whose acts Contractor or Subcontractor may be liable. Contractor's obligation hereunder shall apply in all instances whether the Indemnitees are made a party to the action or claim or are subsequently made a party to the action by third-party in-pleading or are made a part to a collateral action arising, in whole or in part, from any of the issues emanating from the original cause of action or claim. Contractor's obligation hereunder shall apply even when such claims, damages, losses and expenses are caused in part by the Indemnitees. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.1.1 Contractor shall defend, indemnify and hold harmless the Indemnitees against all fines, penalties or losses, including reasonable attorney's fees and costs, incurred as a result of violations by Contractor of any statute, ordinance, regulation, rule of law of any political subdivision or duly constituted public authority.

§ 3.18.1.2 The Contractor assumes the entire risk, responsibility, and liability for any and all damage or injury of every kind and nature whatsoever (including death resulting therefrom) to all persons, whether employees of the Contractor or otherwise, and to all property (including the Work itself) caused by, resulting from, arising out of or occurring in connection with the execution of the Work, or in preparation for the Work, or any extension, modification, or amendment to the Work by the Change Order or otherwise.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages,

compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§3.18.3 The Contractor assumes all risks and bears any costs and expenses occasioned by neglect or accident during the progress of the Work until, at earliest, same shall have been completed and accepted by the Owner. The Contractor must properly protect all adjacent work during the progress of construction and make good all damage that may occur to any work herein specified or to adjacent property in consequence of the work herein specified.

§3.18.4 The work in every respect shall be under the care of the Contractor and at his risk, he shall properly safeguard against any or all injury or damage to the public, to any property, materials, or thing, except where stipulated otherwise in the specifications, and also be responsible for any such damage or injury from his undertaking of this work to any person or persons or thing connected therewith.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. The term "Architect" means the Architect or the Architect's authorized representative.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect whose status under the Contract Documents shall be that of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect and Construction Manager will provide administration of the Contract as described in the Contract Documents (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the two-year period for correction of Work described in Paragraph 12.2. The Architect and Construction Manager will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect and Construction Manager in all communications that relate to or affect the Architect or Construction Manager's services or professional responsibilities. The Owner shall promptly notify the Architect and Construction Manager of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner, Construction Manager and Architect. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect and Construction Manager's evaluations of the Contractor's Applications for Payment, the Architect and Construction Manager will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect and Construction Manager considers it necessary or advisable, the Architect and Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect or Construction Manager nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect or Construction Manager will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect or Construction Manager will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect and Construction Manager will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 INTENTIONALLY OMITTED

§ 4.2.11 The Architect will interpret and decide matters concerning the Contractor's performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site or provide material or equipment directly to the Contractor. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Identification of Subcontractors required by N.J.S.A. 18A:18A-18 shall be provided with the bid in accordance with that statute. The names of all Subcontractors and material suppliers not covered by N.J.S.A. 18A:18A-18 shall be submitted to the Architect for approval not later than seven (7) days after the date of the notice to proceed. The list of proposed Subcontractors shall include a description of the materials and equipment each proposes to furnish and install in the work. The description shall be in sufficient detail to allow the Architect to determine general conformance to the Contract Documents. Approval of the submittals required under the Article shall not relieve the Contractor from conformance to the Contract Documents.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.2.1 The Architect will promptly reply in writing to the Contractor stating whether the Owner or Architect, after due investigation, has reasonable objection to any such proposed persons. If adequate data on any proposed Subcontractor or manufacturer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure of the Owner or Architect to reply promptly shall not constitute a waiver of any of the requirements of the Contract Documents, and all materials and work furnished by the listed Subcontractor or manufacturer must conform to such requirements.

§ 5.2.3 INTENTIONALLY OMITTED

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected, or decide to self-perform such Work, if the Owner or Architect makes reasonable objection to such substitution or self-performance, including on the grounds that Contractor is attempting to improve its profits on the project without commensurate benefit to the Owner.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 The Contractor shall obligate each Subcontractor specifically to comply with the New Jersey Law Against Discrimination N.J.S.A. 10:5-31 and N.J.A.C. 17:27 et seq. to avoid discriminatory practice in employment.

§ 5.3.2 The Contractor shall obligate each Subcontractor to comply with the applicable prevailing wage schedule of the New Jersey Department of Labor and Workforce Development.

§ 5.3.3 The Contractor shall obligate each Subcontractor to comply with the Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq.

§ 5.4 INTENTIONALLY OMITTED

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE ALL WORK. All trades have a mutual obligation to coordinate their work with the other trades and cooperate as necessary with the Contractor, Construction Manager and the Construction schedule – to complete the work as required by the Owner. The Construction Manager will provide assistance to the Contractor for coordination between their work and the Owner.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect and Construction Manager of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent. Should the Contractor be damaged by any Separate Contractor on the Project by reason of such Separate Contractor's failure to perform properly his Contract with the Owner, no action will lie against the Owner and the Owner shall have no liability therefore, but the Contractor may assert his claim for damage against such Separate Contractor as a third-party beneficiary under the Contract between such other Contractor and the Owner.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5 or to other completed or partially completed construction or to the site or adjoining property.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and will allocate the cost among those responsible as the Owner determines to be just, based on the recommendation of the Architect.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.1.1 A directive, order, field directive or field order shall not be recognized as constituting a change in the Work or the Contract Documents or having any impact upon the Contract Sum or the Contract Time, and the Contractor shall have no claim therefor unless it shall, prior to complying with same and in no event no later than five (5) working days from the date such direction or order was given, submit to the Owner, Architect and Construction Manager its change proposal for approval.

§ 7.1.1.2 When submitting its change proposal, the Contractor shall include and set forth in clear and precise detail breakdowns of labor and materials for all trades involved and the estimated impact on the construction schedule including a specific number of days for a time extension. If the proposal does not provide an additional time request, the Contractor shall not be entitled to an extension of time. The Contractor shall furnish spreadsheets from which the breakdowns were prepared, plus spreadsheets if requested of any Subcontractors. The Contractor may not claim additional time at a later date and shall remove any language to that effect from its proposal.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone in accordance with Paragraph 7.4.

§ 7.1.2.1 Except as permitted in Section 7.3 and Section 9.7, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Neither this Contract nor the Work to be performed hereunder can be changed by oral agreement. No course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work and no claims that the Owner has been unjustly enriched by any alteration or addition to the Work, whether there is, in fact, any unjust enrichment, shall be the basis for any alleged implied agreement by the Owner to the change, any alleged waiver of the Owner's right under this Contract or any increase in any amounts due under the Contract or any or a change in any time period provided for in the Contract Documents.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect or Construction Manager and signed by the Owner, Contractor, Construction Manager and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum include those listed in Subparagraph 7.3.4 The total for overhead and profit shall NOT exceed 15% combined and shall not include markups below the Subcontractor level.

§ 7.2.3 Any change in work authorized in writing by the Owner and Architect that will require a change in the cost of the work, whether an additive or deductive change in cost, shall show a complete cost breakdown of labor, material, appropriate increase or reduction in overhead and profit (15% maximum combined) and contract time.

§ 7.2.4 When a Change Order involves both additions and deletions in material, the net quantity is to be determined and the 15% overhead and profit is to be applied to the net change.

§ 7.2.5 When any change in the Work, regardless of the reason therefore, requires or is alleged to require an adjustment in Contract Time, such request for time adjustment shall be submitted by the Contractor as part of the change proposal. Any Change Order approved by the Owner and for which payment is accepted by the Contractor, in which no adjustment in Contract Time is stipulated, shall be understood to mean that no such adjustment is required by reason of the change, and any and all rights of the Contractor or any subsequent request for adjustment of Contract Time by reason of the change is waived.

§ 7.2.6 Request by the Contractor for adjustment of the Contract Amount regardless of the reason therefore, shall be submitted to the Architect and the Owner with itemized labor and material quantities and unit prices to permit proper evaluation of the request. A submission by the Contractor containing unsubstantiated lump sum requests for adjustment of the Contract Amount will not be considered by the Owner and Architect. The Owner and Architect will not be liable for any delay incurred by reason of the Contractor's failure to submit satisfactory justification and back-up with any request for adjustment to the Contract Amount.

§ 7.2.7 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the initial Work which is the subject to the Change Order, including, but not limited to, all direct, indirect and impact costs associated with such change and any and all adjustment to the Contract Sum and the Construction Schedule. The Contractor will not be entitled to any compensation for additional work, impact costs or delays in the Construction Schedule not included in the Change Order.

§ 7.2.8 No additional time will be granted to the Contractor for a Change Order of less than \$100,000.

§ 7.2.9 All Change Orders will be consistent with N.J.A.C. 6A:23A-21.1 and N.J.A.C. 6A:26-4.9.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect or Construction Manager and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.2. In such case, and also under Section 7.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data, including such supporting and itemized data from Subcontractors. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor shall be in accordance with the New Jersey Prevailing Wage Rates at the time of the Contract commencement with no additional "labor burden", future increases or any other considerations;
- .2 Costs of materials, supplies, and equipment, whether incorporated or consumed;

- .3 Rental costs of machinery and equipment, exclusive of hand tools, only when machinery or equipment is not already on site and without any compensation for Contractor or Subcontractor-owned machinery or equipment;
- .4 Costs of premiums for all bonds and insurance shall be limited to 1.5%, and must be directly related to the change; and
- .5 Costs of home office, supervision and field office personnel, whether directly or indirectly attributable to the change, WILL NOT BE PERMITTED UNDER ANY CIRCUMSTANCE.

§ 7.3.5 INTENTIONALLY OMITTED

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost plus the 15% combined overhead and profit as confirmed by the Architect or Construction Manager. When both additions and credits covering related Work or substitutions are involved in a change, the increase or decrease for overhead and profit shall be figured on the basis of net change with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect or Construction Manager will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect or Construction Manager determines, in the Architect or Construction Manager's professional judgment, to be reasonably justified. The Architect or Construction Manager's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect or Construction Manager concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect or Construction Manager will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect and/or the Construction Manager may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's and/or the Construction Manager's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and Construction Manager within five (5) calendar days and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's and/or Construction Manager's order for a minor change without prior notice to the Architect and Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.3 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.2.4 Owner, in coordination with the Contractor, shall set work hours. Contractor may be required to work nights, weekends or holidays as necessary to complete the Work in accordance with the Schedule or in coordination with school activities. Under no circumstances shall the Contractor begin or continue with work that is adversely impacting School activity or operations. All utility shutdowns, interruptions, work in or adjacent to existing buildings will be coordinated through the Owner, or Construction Manager, and may have to be performed during hours when the School is not in operation. All cutting, hammering or other activity that is noisy, produces smoke or fumes or is otherwise disruptive to the School may have to be done during hours when the School is not in operation. Work required to be performed during non-school operating hours, as determined by the Owner or Construction Manager, will be performed at no additional cost to the Owner.

§ 8.2.5 Absent direction of the Owner to the contrary, Work shall proceed uninterrupted to Final Completion. The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial occupancy and use of all or part of the completed Work in accordance with the Milestone Dates set forth in other sections of the Contract Documents, as per approved Schedule, and that the Owner has made arrangements to discharge its public obligations based upon the Contractor's achieving Substantial Completion of all of the Work within the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to complete substantially or cause the Substantial Completion of any portion of the Work as required by the Project Construction Schedule and/or within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be difficult to ascertain.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) negligence, bad faith, activate interference or tortious conduct of the Owner; (2) changes ordered in the Work; or (3) other occurrences, despite Contractor's best avoidance and mitigation efforts, beyond the control and without the fault or negligence of the Contractor and as to which the Contractor has not accepted the risk elsewhere in the Contract Documents, then, provided that the Contractor is in compliance with Subparagraph 8.3.3 hereof, the Contract Time shall be extended by Change Order or Construction Change Directive for the length of time actually and directly caused by such occurrence as determined by the Architect and approved by the Contractor and Owner (such approval not to be unreasonably withheld, delayed, or conditioned); provided, however, that such extension of Contract Time shall be net of any delays caused by or due to the fault or negligence of the Contractor or which are otherwise the responsibility of the Contractor or as to which Contractor has accepted the risk elsewhere in the Contract Documents and shall also be net of any contingency or "float" time allowance included in the Contractor's construction schedule. The Contractor shall, in the event of any occurrence likely to cause a delay, cooperate in good faith with the Architect and Owner to minimize and mitigate the impact of any such occurrence and do all things reasonable under the circumstances to achieve this goal whether or not an extension of time may be available to Contractor.

§ 8.3.2 Any claim for extension of time shall be made in writing to the Architect not more than five (5) days after the delay commences or Contractor reasonably should know a delay is likely, whichever is earlier, otherwise, it shall be waived. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the work. No claim made beyond the five (5) days shall be considered valid.

§ 8.3.2.1 The Contractor agrees that if any delay in the Contractor's works unnecessarily delays the work of any other Contractor or Contractors, the Contractor shall in that case pay all costs and expenses incurred by such parties due to

such delays and hereby authorizes the Owner to deduct the amount of such costs and expenses from any moneys due or to become due the Contractor under this Contract. The Architect shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor. His decision shall be final.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, any extension of the Contract Time, to the extent permitted under Paragraph 8.3.1., shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity or (4) other similar claims (collectively referred to in this Paragraph 8.3.3. as "delays"), whether or not such delays are foreseeable, subject to the limitations of N.J.S.A. 18A:18A-41. In no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any delay including without limitation consequential damages, lost opportunity cost, impact damages or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including without limitation ordering changes in the Work or directing suspension, rescheduling or correction of the Work) regardless of the extent or frequency of the Owner's exercise of such rights or remedies shall not be construed as an act of interference with the Contractor's performance of the Work. This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents that expressly permit same.

§ 8.3.4 The Contractor agrees that the Owner can deduct from the Contract Sum, or shall be entitled to reimbursement for, any wages or fees paid or to be paid by the Owner to any inspectors, the Architect and the Construction Manager employed by it on the Project for any number of days in excess of what would have been required had the Work timely been substantially and finally completed and that such wages and fees are determinable damages not factored into the liquidated damages set forth in the Agreement.

§ 8.3.5 Contractor accepts the risk of interruptions and delays in the Work from typical weather conditions. Where the cause of delay is due to weather conditions, an extension of time shall be granted only for unusually severe weather, as determined by reference to historical data. The term "historical data" as used in the previous sentence shall be construed to require a consideration of the five previous years of data at the location of the Project for the month in which the weather delay is claimed. Weather is unusually severe if the number of days in which weather conditions preclude the performance of the Work during the month in question exceed the average shown in the historical data for the month in question; the extension of time shall be limited to the number of days in excess of the average.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 INTENTIONALLY OMITTED

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work which in the aggregate equals that total Contract Sum, divided so as to facilitate payments to Subcontractors, supported by such evidence of correctness as the Architect may direct or as required by the Owner. It will be necessary for all Contractors to divide their contract into a separate schedule for the work performed at the project. These schedules, when approved by the Architect, Construction Manager and Owner, shall be used to monitor the progress of the Work and as a basis for Certificates for Payment. All items with entered values will be transferred by the Contractor to the "Applications and Certificate for Payment," and shall include the latest approved Change Orders and Construction Change Directives. Change Order values and Construction Change Directive values shall be broken down to show the various subcontracts. The Application for Payment shall be on AIA Document G702 and G703 and the approved Voucher obtainable from the Owner. Each item shall show its total scheduled value, value of previous applications, value of the application, percentage completed, value completed and value yet to be completed. All blanks and columns must be filled in, including every percentage complete figure. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect.

§ 9.2.1 In addition to other elements of the Work, Contractor shall include the following separate items in its schedule of values:

Punch List Work - Minimum of 1% of contract value
Value for testing

Value for Record Drawings and manuals
Value for final clean-up and monthly value for daily clean up by the Contractor
Value for equipment start-up and commissioning
Value for shop drawings
Value for Owner's attic stock
Safety protections
Project Schedule and Monthly Updates
Winter Protection
Allowance
TAB coordination shiv, belts and modifications, as required

§ 9.3 Applications for Payment

§ 9.3.1 The Contractor shall submit to the Architect an itemized Application for Payment for their Contract on AIA Document G702 and G703 and the approved Voucher obtainable from the Owner. Payroll Certification for all employees of all of the workers on the project, including Contractor's, Subcontractors, and Sub-subcontractors, shall be submitted as well as other such data for the purposes of summarizing the Work and tracking the Project. The Architect and the Construction Manager will process the application and forward it with his recommendations to the Owner

§ 9.3.1.1 INTENTIONALLY OMITTED

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Upon final completion, the Contractor shall submit a separate voucher for the full amount of the retainage along with the Consent of Surety, A.I.A. Form G707A, and the Contractor shall be required to furnish a Maintenance Bond for 100% of the Project Cost for a period of two (2) years from the Date of Final Acceptance.

§ 9.3.1.4 Upon final acceptance of the work performed pursuant to this Contract for which the Contractor has agreed to the withholding of payments pursuant to Article 9 of this Contract, all amounts being withheld by the Owner shall be paid in accordance with Paragraph 9.3.1.3 without further withholding of any amounts for any purposes whatsoever, provided that all obligations of the Contract Documents has been satisfactorily completed and no claims for which Contractor may have responsibility are pending or anticipated.

§ 9.3.1.5 In addition to requirements set forth elsewhere in the Contract Documents, applications for payment shall be accompanied by the following, all in form and substance satisfactory to the Owner, Architect and Construction Manager:

1. A current Contractor's lien and claim waiver and a duly executed and acknowledged sworn statement by an officer of the Contractor showing all subcontractors and materialmen with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any subcontractor and materialmen in the requested progress payment and the amount to be paid to the Contractor from such progress payment.
2. A Subcontractor's lien and claim waiver for each Subcontractor identified in the statement referenced in the preceding paragraph.
3. A Purchase Order or Voucher if required by the Owner.
4. A Schedule Update approved by the Construction Manager and Architect.
5. A Third Party (not the General Contractor) written Field Safety Inspection Report.
6. An updated Shop Drawing Log showing the status of all of the required Shop Drawings.

§ 9.3.2 Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with Sections 9.3.2.1, 9.3.2.2, 9.3.2.3 and 9.3.2.4 and satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. The Contractor shall store the off-site materials and equipment in a secure, bonded warehouse.

§ 9.3.2.1 With each Application for Payment the Contractor shall submit to the Architect and Owner a written list identifying each location where materials are stored off the Project site and the value of materials at each location. The Contractor shall procure insurance satisfactory to the Owner for materials stored off the Project site in an amount not less than the total value thereof.

§ 9.3.2.2 The consent of any surety shall be obtained to the extent required prior to the payment for any materials stored off the Project site.

§ 9.3.2.3 Owner, Architect and Construction Manager shall have the right to make inspections of the off-site storage areas at any time.

§ 9.3.2.4 Materials stored off site shall be protected from diversion, destruction, theft and damage to the satisfaction of the Owner, shall specifically be marked for use on the Project and shall be segregated from other materials at the storage facility.

§ 9.3.3 The Contractor warrants and agrees that title to all Work will pass to the Owner either by incorporation in the construction or upon receipt of payment therefor by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests, or encumbrances whatsoever, that the vesting of such title shall not impose any obligation on Owner or relieve Contractor of any of its obligations under the Contract, that the Contractor shall remain responsible for damages to or loss of the Work, whether completed or under construction, until responsibility for the Work has been accepted by Owner in the manner set forth in the Contract Documents, and that no Work covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

§ 9.3.4 The Owner will issue timely payments to the Contractor in accordance with the requirements of "The Prompt Payment Act", N.J.S.A. 2A:30A-1, et seq. The Contractor is hereby notified that the Owner, as a public entity, requires all payments to be approved at scheduled public Board of Education meetings. The vote on authorization for payments will be made at the first public meeting of the Board, following the Board's receipt of the Architect's authorization for payment, and paid during the subsequent payment cycle.

Typically, the Owner has monthly public business meetings. Provided an Application for Payment is received by the Architect not later than the date required by the Owner, and upon issuance of a Certificate of Payment for all or part of the Application for Payment, the Owner shall make payment to the Contractor not later than the tenth (10th) day after the Owner's regular public meeting held during the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than ten (10) calendar days after the next regular public meeting of the Owner held after the late submitted Application for Payment has been reviewed and certified for payment by the Architect.

§ 9.3.4.1 Certification shall be subject to Consent of Surety presented by the Contractor for each application.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within Fourteen days after receipt of the Contractor's Application for Payment, either (1) issue to the Construction Manager a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Construction Manager a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor, Owner and Construction Manager of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect.

However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect or Construction Manager may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents;
- .8 avoidable delay in the progress of the Work;
- .9 delay in the submission for approval of the names of Subcontractors, materialmen, sources of supply, shop drawings, samples, or other submittals;
- .10 failure to maintain the Project Site in a clean, safe and satisfactory condition in accordance with good construction practices as recommended by the Architect after consultation with the Contractor and Construction Manager;
- .11 failure to submit updates as required by the Owner or as required by the Contract Documents;
- .12 failure of the Contractor to comply with mandatory requirements for maintaining record drawings. The Contractor shall be required to check record drawings each month. Written confirmation that the record drawings are up-to-date shall be required by the Architect before approval of the Contractor's monthly payment requisition will be considered;
- .13 failure of Contractor to provide a third-party Insurance Safety Site Inspection Report monthly and remedy all issues promptly;
- .14 reasonable evidence that a legal impediment has arisen or can reasonably be expected to arise that would preclude the Contractor from completing the Work, timely or otherwise; or
- .15 Failure to cooperate with Owner, Construction Manager or Architect relative to construction schedule, material storage, coordination with the Owner, clean up or safety.

§ 9.5.2 INTENTIONALLY OMITTED

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and Construction Manager and the Contractor shall reflect such payment on its next Application for Payment.

- .1 If the Contractor disputes any determination by the Architect with regard to any Certificate of Payment, the Contractor nevertheless expeditiously shall continue to prosecute the Work.
- .2 The failure of the Owner to retain any percentage payable to the Contractor or any change in or variation of the time, method or condition of payments to the Contractor shall not release or discharge to any extent whatsoever the Surety upon any bond given by Contractor hereunder. The Owner shall have the right, but not the duty, to disregard any schedule of items and costs that the Contractor may have furnished and defer or withhold in whole or in part any payment if it appears to the Owner, in its sole discretion, that the balance available in the Contract Sum as adjusted and less retained percentages, may be insufficient to complete the Work.
- .3 The Contractor agrees that the time and conditions for payment under the Contract shall be as stated in the Contract Documents. The Contractor specifically agrees that Owner's failure to give, or timely give, notice of:
 - .1 any error in an invoice or application for payment submitted by the Contractor for payment;
 - .2 any deficiency or non-compliance with the Contract Documents with respect to any Work for which payment is requested, shall not waive or limit any of the Owner's rights or defenses under the Contract Documents, or require the Owner to make a payment in advance of the time, or in an amount greater than, as provided by Contract Documents; or
 - .3 The Contractor shall make payments to its Subcontractors in accordance with the provisions of any applicable law governing the time, conditions, or requirements for payment to its Subcontractors, and shall comply with the provisions of any such law. The Contractor and its Surety shall indemnify and defend the Owner any loss, cost, expenses, or damages including attorney's fees, arising from or relating to the Contractor's failure to comply with such law.
- .4 The Contractor shall make payments to its Subcontractors in accordance with the provisions of any applicable law governing the time, conditions, or requirements for payment to its Subcontractors, and shall comply with the provisions of any such law. The Contractor and its Surety shall indemnify and defend the Owner any loss, cost, expenses, or damages including attorney's fees, arising from or relating to the Contractor's failure to comply with such law.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect. Notwithstanding Certification by the Architect, the Owner may refuse to make payment based on any default by the Contractor including, but not limited to those defaults set forth in Section 9.5.1. The Owner shall not be deemed in default by reason of withholding payment while any of such defaults by the Contractor remain uncured.

§ 9.6.2 If a Subcontractor has performed in accordance with the provisions of its Contract with the Contractor and the Work has been accepted by the Owner, the Owner's authorized approving agent, or the contractor, as applicable, and the parties have not otherwise agreed in writing, the Contractor shall pay to its Subcontractor within 10 calendar days of the receipt of payment from the Owner, the full amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor.

§ 9.6.8 INTENTIONALLY OMITTED

§ 9.7 Failure of Payment

If the Owner does not pay the Contractor as required by "the Prompt Payment Act"; does not provide a written statement of the amount withheld and the reason for the withholding; and the Owner is not engaged in a good faith effort to resolve the reason for the withholding, then the Contractor may, upon seven calendar days' written notice to the Owner, stop the Work, without penalty for breach of contract, until payment of the amount owing has been received. The Contract Time shall be extended appropriately.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof which the Owner agrees to accept separately is sufficiently complete in accordance with this definition and the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The Work will not be considered substantially complete until all project systems included in the Work are operational as designed and scheduled, all designated or required inspections, certifications, permits, approvals, licenses and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial use and occupancy of the Project are received, designated instruction of Owner's personnel has been completed, and all final finishes within the Contract are in place. In general, the only remaining Work shall be minor in nature, so that the Owner can occupy the building on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's (or those claiming by, through or under the Owner) normal operations. Contractor recognizes that normal operations require the use and occupancy of the Work by students and faculty without interruption and that any punchlist or corrective work shall be done at times when the Work is not so occupied. As a further condition of substantial completion acceptance, the Contractor shall certify that all remaining Work will be completed within thirty (30) consecutive calendar days following the date of substantial completion. In addition to any other definitions of Substantial Completion as defined by the contract documents, the following is required before the project is considered "Substantially Complete":

- .1 All required final inspections have been completed by the authority having jurisdiction resulting in a TCO or CO.
- .2 Air Balancing Reports: Reports can be handwritten field notes but must be reviewed and approved via the shop drawing process by the Mechanical Engineer. Final Air and Water Balancing Reports certified by the licensed balancer are required for "Final Acceptance" and the start of the warranty period. (These reports must be submitted in accordance with the shop drawing process to the Architect so that they can be tracked and approved and distributed to all applicable parties).
- .3 Equipment Start Up Reports: Reports can be handwritten field notes but must be reviewed and approved via the shop drawing process by the Mechanical Engineer. (These reports must be submitted in accordance with the shop drawing process to the Architect so that they can be tracked and approved and distributed to all applicable parties).
- .4 Owner On-site ATC Training: Refer to the ATC specifications for training requirements on-site and off-site. The Owner does not have beneficial use of the mechanical system until they can operate it following this training.
- .5 Completion of Commissioning: Refer to the Start-up and Adjustment specifications. This process will require the Owner's Operator, Construction Manager and the Mechanical Engineer on site to witness a

demonstration and operation of every mechanical device. The devices shall be operated from the on-site Owner's ATC Computer and verified by the Mechanical Contractor's field personnel to confirm proper operation. In addition to this demonstration, the contractor shall demonstrate Owner required maintenance of all mechanical equipment to maintain the manufacturer's warranty. This should include but not be limited to belt tension/adjustments, filters, etc. Please schedule several days for the commissioning process.

- .6 Written certification from a qualified AHC (Certified Architectural Hardware Consultant) that the hardware, cores and keying has been installed and tested in every door and is 100% complete for each phase or the total project whichever comes first.
- .7 Provide a Fire Alarm System NFPA Record of Inspection and Testing Certification Form.

§ 9.8.2 "PUNCH LIST": When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items "PUNCH LIST" to be completed or corrected along with all special warranties required by the Contract Documents endorsed by the contractor prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.2.1 The Contractor shall perform a Quality Control / Quality Assurance QC/QA Punchlist of all work prior to requesting Substantial Completion and a punch list from the Construction Manager and Architect. The Contractor's Project Manager shall take the lead and conduct an onsite review with the Contractor's superintendent and representation from every Prime Subcontractor. Notification of this onsite walk thru shall be provided in writing to Construction Manager, Architect and Owner who may or may not choose to attend. The Contractor's Project Manager shall record and distribute this QC/QA Punchlist in a matrix that provides an additional column for the Contractor to document the completion of the work and the date. After successful completion of the Contractor's QC/QA Punchlist and all work, the Contractor shall request the Construction Manager and Architect perform a Punchlist. Substantial Completion shall be requested in accordance with paragraph 9.8.1.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents and the requirements above so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit in writing a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.4.1 The Architect's Certificate of Substantial Completion shall be subject to the Owner's final approval.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of

the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.9.4 The occupancy of any portion of the Work shall not constitute acceptance of any Work, except as hereinafter stated, nor does it waive the Owner's right to Liquidated Damages. Final Acceptance of the Work shall be for the whole Work only and not part.

§9.9.5 As portions of the Project are completed, and occupied, Contractor shall ensure the continuing construction activity will not unreasonably interfere with the use, occupancy and quiet enjoyment of the completed portions thereof.

- .1 The Contractor agrees to coordinate the Work with the Architect and the Owner in order to minimize disturbance to occupied portions of the structure.
- .2 In the event performances or scheduled events by the Owner are conducted in close proximity to the Work in progress, the Contractor agrees to cease all work which may disturb the Owner's occupants at the site.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Owner as part of the final application for payment. The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees and Maintenance Bond have been received and accepted by the Owner.

§ 9.10.1.1 The Architect's Certificate of Final Completion shall be subject to the Owner's final approval.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, (6) as-built drawings, and (7) evidence of compliance with all requirements of the Contract Documents: notices, certificates, affidavits, other requirements to complete obligations under the Contract Documents: including but not limited to (a) instruction of Owner's representatives in the operation of mechanical, electrical, plumbing and other systems, (b) delivery of keys to Owner with keying schedule: master, sub-master and special keys, (c) delivery to the Construction Manager of Contractor's General Warranty (as described in Paragraph 3.5) and each written warranty and assignment thereof prepared in duplicate, certificates of inspections, and bonds for the Construction Manager's review and delivery to Owner, (d) delivery to the Construction Manager a printed or typewritten operating, servicing, maintenance and cleaning instructions for all Work; parts lists and special tools for mechanical and electrical Work, in approval form, (e) delivery to the Construction Manager of specified Project record documents, (f) delivery to Owner of a Final Waiver of Liens (AIA Document G-706 or other form satisfactory to Owner), covering all Work including that of all Subcontractors, vendors, labor, materials and services, executed by an authorized officer and duly notarized (g) delivery to the Owner of the Maintenance Bond. In addition to the foregoing, all other submissions required by other articles and paragraphs of the Specifications including final

construction schedule shall be submitted to the Architect before approval of final payment. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.1.1

- .1 The Contractor must fully comply with the job safety requirements in addition to all Federal, State and Local safety guidelines. All costs associated with complying with all safety requirements shall be included in the Contractor's base bid.
- .2 The Contractor will serve as the overall Project Safety Coordinator and shall be responsible for all issues of safety and protection. The Contractor shall designate a safety person at the job site while the Contractor is working on the project site. The designated safety person shall be responsible for the safety of their work and for their workers and to make continuous inspections for all safety issues relating to his work. The Architect and/or the Construction Manager are not responsible for safety on this project but will endeavor to promote safety. Contractor must comply with job Safety Requirements in addition to OSHA and local agency requirements. Failure to comply with safety requirements will be grounds for withholding of payments.
- .3 Contractor will comply with all reasonable requests of the Owner and Construction Manager with respect to additional security and protections required for work interfacing with Facility Operations. Safety is of utmost importance on this project and all issues relative to safety and protection of the Facility, Staff and Occupants will be treated as emergency needs and will not be subject to the 7-day notice requirements of Article 14.
 - .1 The Contractor shall provide, maintain, relocate and remove in coordination the Construction Manager, a 6' high, perimeter security fence. Fence will surround the building or relevant portions thereof and proposed parking areas and will have signage attached at 100' intervals advising "Construction Area – Please Keep Out". The Contractor to be responsible for opening and securing site each day.
 - .2 Orange safety fencing will be installed around the entire area of any and all earthwork, excavations, etc. and will be maintained until the work is complete.
 - .3 This is a hard hat job. Identifying hard hats shall be worn at all times.
 - .4 Hot work permits will be issued by foreman for all activities involving open flames.

- .4 The proper execution of the required safety provisions is directly related to the general condition safety line item on the schedule of values. The failure to provide a competent person on site to properly identify and take immediate corrective action may result in deductions to the general condition safety line item of the schedule of values.
- .5 The Contractor shall be responsible for the immediate investigation and resolution of all safety and environmental complaints / issues generated by contractor employees, owners, owner's representatives or members of the public.
- .6 Contractor shall maintain all egress routes throughout building. Contractor shall post exit signs as coordinated with the Construction Manager. Contractor shall provide wall hung fire extinguishers throughout building as deemed necessary by the Construction Manager and fire officials.
- .7 Contractor's safety representative shall perform a daily safety inspection walk through to ensure that all requirements of the OSHA Standards, Fire Protection Standards and Safe Work Practices are being with and/or corrected. The responsibility of the Contractor is to provide a safe and healthy work environment for construction personnel, Owner's personnel and representative, and the public.
- .8 Upon written receipt of safety concerns and /or issues, the Contractor shall respond in writing addressing how the safety concerns or issues were resolved. The Construction Manager shall be copied on all safety-related correspondence.
- .9 The Contractor's response and compliance with correction of deficiencies noted in the safety concerns notice issued by the Authority having jurisdiction is mandatory. Failure to comply will be grounds for withholding of progress payments until the conditions are acceptable to OSHA or Authority having local jurisdiction.
- .10 The Contractor shall submit to the Construction Manager, a copy of all licenses (welding, power nailers, asbestos, etc.) as required by applicable agencies.
- .11 Contractor shall have all required personal protective equipment and materials available for use by each employee as required by Federal, State and Local guidelines.
- .12 Contractor shall supply proper equipment and crew sizes as necessary to safely complete the work.
- .13 Contractor shall provide documented safety training for each of their employees and subcontractor's employees no later than the first day they arrive on site. The training shall be documented and signed by the trainer and employee. A copy of all safety-training documents is to be provided to the Owner and updated as manpower loading increases.
- .14 The Contractor shall supply (2) two OSHA approved means of access/egress to each floor and roof for the course of the entire project for use by all applicable parties. The Contractor shall erect and maintain OSHA approved pedestrian walking bridges, for emergency access/egress and as necessary to protect personnel from overhead work.
- .15 The Contractor shall be responsible for providing and maintaining all temporary emergency egress routes. The Contractor shall obtain the approval of the Building and Fire Departments for all temporary emergency egress routes. The Contractor shall provide for fire separation walls between occupied areas as required by local officials.
- .16 The Contractor shall provide, relocate and /or maintain barricades, signage, provide flagmen etc. as necessary to ensure public safety and safe egress.
- .17 The Contractor shall notify the Construction Manager immediately upon arrival of OSHA inspector/representative to the site.
- .18 The Contractor shall submit to the Construction Manager all MSDS sheets and shall cooperate in the posting of all required notifications relative to the use of hazardous substances on the property. Contractor to comply with New Jersey law regarding the use or storage of hazardous substances in Schools. MSDS sheets shall be posted prior to product being delivered to site.
- .19 The Contractor, Subcontractors, vendors, etc. must enforce a no smoking, vaping or alcohol use policy for all employees during the entire course of the project. Any worker found violating these restrictions, or being belligerent, will be subject to removal from the site at the sole discretion of Owner.
- .20 The Contractor shall be responsible to secure the site at the end of each workday by an effective means and maintain same until all parties determine same is no longer required.
- .21 For the safety of occupants, staff, and the public, the steel erection must be scheduled and coordinated with the Construction Manager. Swinging of steel and crane boom over occupied space will not be allowed. Steel Subcontractor shall provide additional barricades and fencing around his crane and steel at all times.

.22 The Contractor must submit an acceptable OSHA compliant site specific written safety plan to the Construction Manager prior to mobilizing on site. The written safety plan shall include (as applicable to their work) but is not limited to the following:

- No smoking, vaping or alcohol use is allowed on the project, including while away from the site if the worker will go to or return to the site that day. Any worker found violating these restrictions, or being belligerent, will be subject to removal from the site. (Contractors shall post required signs).
- Full time hard hat policy (identifying hard hats shall be worn at all times).
- Site specific emergency action plan with contractor phone numbers, active 24 hours a day, 7 days a week.
- Competent on-site safety representative, named and active (Provide alternate)
- Scaffold erection plan, including a log of daily inspections.
- Full time fall protection plan for exposures over 6'-0".
- Job site signage plan (Perimeter fence warning signs posted 50'-0" o/c.
- First aid and CPR provisions.
- OSHA 200 log and Job Safety and Health Protection poster.
- Daily clean up.
- Hazard Communication Program with MSDS logged and maintained.
- Daily diary of work, issues, and incident, etc.
- Sheeting, shoring and excavations protection line.
- GFI safety program.
- Hazardous Energy Control Lock out tag out program.
- Required safety clothes; Eye & ear protection, respirators, boots, belts, gloves etc. as appropriate to their work requirement.
- Fire Extinguishers.
- Removal guard rail and protection at material loading areas, 200lb force minimum requirement.
- All stairs and platforms must have railings, 200lb force minimum requirement. Stair pains and landings must be filled prior to their use.
- Daily inspection of tools and equipment; verify safety devises are operational.
- Ladder usage plan.
- Weekly toolbox meetings, documented and signed by each employee
- Temporary heat procedures.

.23 The Contractor shall maintain and submit a complete copy of the written safety plan, logs, diaries, plans and programs on site for the project files.

.24 The Contractor shall provide a third-party Insurance Safety Site Inspection Report monthly and remedy all issues promptly.

.25 The speed limit within the project property is 5 MPH. Contractor employees operating vehicles in excess of the speed limit or in any otherwise unsafe manner will be directed to leave the site and not permitted to return.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction as well as any other real or personal property of the Owner.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.2.1 It is the Contractor's responsibility to determine the existence of potentially hazardous materials, including lead, and to protect his workmen and the work area.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable directly to grossly negligent acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal.

§ 10.2.10 The Contractor shall remove snow or ice which may accumulate on the site within areas under his control which might result in damage or delay.

§ 10.2.11 The Contractor shall take all precautions necessary to prevent loss or damage caused by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner and Contractor, whether or not forming part of the Work, located within those areas of the Project to which the Contractor has access. Whenever unattended, including nights and weekends, mobile equipment and operable machinery shall be kept locked and made inoperable and immovable.

§ 10.2.12 Neither the Owner nor the Construction Manager nor the Architect shall be responsible for providing a safe working place for the Contractor, the Subcontractors or their employees, or any individual responsible to them for the work.

§ 10.2.13 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work as necessary from injury or any cause.

§ 10.2.14 The Contractor shall promptly report in writing to the Owner, Construction Manager and Architect all accidents arising out of or in connection with the Work which caused death, personal injury or property damage giving full details and statements of any witnesses. In addition, if death, serious personal injury or serious property damage is caused, the accident shall be reported immediately by telephone or messenger to the Owner, Construction Manager

and Architect.

§ 10.2.15 Contractor is required to follow and enforce the work rules set forth below in addition to other rules set forth in the Contract Documents. Failure to comply with or enforce any of these rules will be grounds for suspension and/or termination of this Contract:

- .1 Anyone found impaired will be escorted from the Project site.
- .2 No use of illegal drugs or prescription medications which could induce drowsiness or otherwise impair perception or performance. Use of illegal drugs may result in prosecution to the fullest extent of the law. Any warning associated with use of prescription drugs must be complied with, particularly warning against operation of machinery and equipment.
- .3 No horseplay or rough housing will be allowed.
- .4 No sexual, racial, or ethnic harassment, or similar conduct will be tolerated.
- .5 All employees shall use proper sanitation habits including use of toilet facilities and garbage cans.
- .6 All employees shall dress in clothing appropriate for the work they are to perform. All personnel are to wear hardhats, safety shoes, glasses, gloves, masks or respirators, noise protection devices, and other protective clothing and equipment as required by OSHA standards.
- .7 All equipment is to be properly stored and/or secured at the end of the workday or if it is to remain idle for greater than one hour.
- .8 All personnel are to be made aware of the availability of Material Safety Data Sheets for materials used at the Project site. This information is available from the Contractor using the product. The Contractor shall maintain a copy of all MSDS forms at the construction site office for all personnel to review.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up adjustments shall be accomplished as provided in Article 7.

§ 10.3.3 INTENTIONALLY OMITTED

§ 10.3.4 INTENTIONALLY OMITTED

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.3.7 Prior to bringing any fill material (such as topsoil, engineered fill, DGA, tire scrub at the construction entrance, etc.) onto the project site, the Contractor must have the material tested and certified to be clean and free from any hazardous material. Provide this information per the submittal requirements via a shop drawing.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

§ 10.4.1 – EMERGENCY/SAFETY PLAN

All parties involved in the construction process should be aware of emergency services that may be required during the construction process.

Contractor shall establish the site-specific Emergency Action Plan and, after approval by the Owner, and local authorities, shall display at site trailers and various locations at the site.

In case of an accident, emergency, or injury on the job site, the Contractor shall immediately follow the Site-Specific Emergency Action Plan. Following the incident, the Contractor shall submit to the Construction Manager a complete written accident report detailing the circumstances which caused the accident, extent of injuries, damage to the building, time of accident, corrective action required, etc.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

All insurance provisions shall be confirmed with the Owner's Insurance Agent.

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located and such company shall be rated at least A- by A.M. Best.

§11.1.1.1 Construction Manager shall be included as additional insured in all places where Architect is named. Contractor shall, without in any way altering Contractor's liability under the Contract or applicable law, obtain, pay for and maintain insurance for the coverages and amounts of coverage not less than those set forth below in the Schedule of Insurance Coverages and shall provide to Owner certificates issued by insurance companies satisfactory to Owner to evidence such coverage no later than 7 days of the date of the execution of the Agreement and prior to any personnel or equipment being brought onto and/or before any work commences at the job site. The coverage afforded under any insurance obtained pursuant to this paragraph shall be primary to any valid and collectible insurance carried separately by any of the indemnities. Such certificates shall provide that there shall be no cancellation, non-renewal or material change of such coverage without thirty (30) days prior written notice to Owner. In the event of any failure by Contractor to comply with the provisions of this Article 11, Owner may, at its option, on notice to Contractor, suspend the Contract for cause until there is full compliance with this Article 11 and / or terminate the Contract for cause. Alternatively, Owner may on twenty-four hour's notice purchase such insurance at Contractor's expense, provided that Owner shall have no obligation to do so, and if Owner shall do so, Contractor shall not be relieved of or excused from the obligation to obtain and maintain such insurance amounts and coverages. Contractor shall provide to Owner a copy of any and all applicable insurance policies. The Owner, Construction Manager, Architect, other Indemnitees referenced in Section 3.1.8, the State of New Jersey and the New Jersey Department of Education shall be named as additional insured on a primary and non-contributory basis on all Insurance Policies to be provided by the Contractor.

§ 11.1.1.2 Schedule of Insurance Coverages

.1 Commercial General Liability, Each Occurrence

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User Notes:

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|----|-----------------------------------|-----------------|
| a. | Each Occurrence: | \$ 5,000,000.00 |
| b. | Damage to Rented Premises: | \$ 300,000.00 |
| c. | Medical Expense (Any one person): | \$ 15,000.00 |
| d. | Personal & Adv Injury: | \$ 5,000,000.00 |
| e. | General Aggregate: | \$ 5,000,000.00 |
| f. | Products – Comp/Op Agg: | \$ 5,000,000.00 |
- .2 Automobile Liability: (Hired autos, scheduled autos, non-owned autos)
- | | | |
|----|--|-----------------|
| a. | Combined Single Limit (each accident): | \$ 1,000,000.00 |
|----|--|-----------------|
- .3 Workers Compensation and Employers Liability:
- | | | |
|----|-------------------------------|-----------------|
| a. | WC Statutory Limits: | |
| 1. | E.L. Each Accident: | \$ 1,000,000.00 |
| 2. | E.L. Disease – Each Employee: | \$ 1,000,000.00 |
| 3. | E.L. Disease – Policy Limit: | \$ 1,000,000.00 |
- .4 Builder’s Risk Insurance: The Contractor shall provide Builder’s Risk Insurance for all risk of physical loss or damage to the property described in the Contract Documents in an amount equal to the Total Project Value, excepting excavations, foundations and other structures customarily excluded by such insurance. The Builders Risk Policy is to include coverage for the perils of Earthquake, Flood, Full Windstorm, Equipment Breakdown and Theft (excluding employee theft), contain an endorsement allowing permission to occupy and include coverage for both transit and offsite storage. In addition to the other additional named insured requirements set forth in this Article 11, the policy is also to include all contractors, subcontractors and sub-subcontractors as Additional Named Insureds on a primary and non-contributory basis. The contractor and all subcontractors are responsible for all policy deductibles and uninsured or underinsured losses, notwithstanding the cause of the loss.
- .5 Contractual liability insurance applicable to the Contractor’s obligations under Section 3.18.
- .6 Workers’ Compensation Insurance of not less than statutory limits.
- .7 Completed Operations Insurance written to the limits specified for liability insurance specified under subparagraph .1 above. Coverage shall be required from the date of the start of Beneficial Occupancy until one year after the issuance date of Final Certificate for Payment.
- .8 Certificates of insurance must be submitted on the ACORD Form, Certificate of Insurance. The Contractor’s ACORD Certificate of Insurance must state "Contractual Liability Included" or it will be rejected.
- .9 The Contractor shall either
- .1 require each of its Subcontractors to procure and to maintain during the life of their subcontracts, Subcontractor’s Public Liability and Property Damage, of the type and in the same amounts as specified in the preceding paragraph; or
- .2 insure the activities of their Subcontractors under their respective policies.

§ 11.1.2 The Contractor shall provide surety bonds for the entire contract amount of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.1.5 Contractor shall furnish a Performance and Payment Bond in the form required by the Contract Documents, without limitation complying with the following specific requirements:

- .1 The bonds shall be executed by a responsible surety licensed in the State of New Jersey Best's rating of no less than A-/X and shall remain in effect for a period of not less than two years following the date of final acceptance or the time required to resolve any items of incomplete or inadequate work and the payment of any disputed amounts, whichever time period is longer;
- .2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his power of attorney indicating the monetary limit of such power;
- .3 A rider including the following provisions shall be attached to each bond:
 - (1) Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change or other modification of the Contract Documents. Any other alterations, change, extension of time or other modification of the Contract Documents or a forbearance on the part of either the Owner or the Contractor to the other shall not release the surety of its obligations hereunder and notice to surety of such matter is hereby waived.
 - (2) Surety further agrees that in the event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or surety shall cause written notice of such default (specifying said default in writing) to be given to the Owner, and the Owner shall have 30 days after receipt of such notice within which to cure such default of such additional reasonable time as may be required if the nature of such default is such that it cannot be cured within 30 days. Such notice of default shall be sent by certified or registered U.S. mail, return receipt requested, first class postage prepaid to the Owner, Construction Manager and Architect.

§ 11.1.6 If any of the foregoing insurance coverages are required to remain in force after final payment, including, but not limited to coverage for completed operations, an additional certificate evidencing continuation of such coverage shall be submitted with the Final Application for Payment.

§ 11.1.7 In no event shall any failure of the Owner to receive certificates of policies or the policies themselves required under Paragraph 11.1 or to demand receipt of such certificates or policies prior to the Contractor commencing Work be construed as a waiver of the Owner or the Architect of the Contractor's obligations to obtain insurance pursuant to this Article 11. The obligation to procure and maintain any insurance required by this Article 11 is a separate responsibility of the Contractor and independent of the duty to furnish a certificate of such insurance policies or the policies themselves.

§ 11.1.8 When any required insurance due to the attainment of a normal expiration date or renewal date shall expire the Contractor shall supply the Owner with certificates of insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection and scope as was provided by the previous policy. In the event, any renewal or replacement policy for whatever reason obtained or required is written by a carrier other than that with whom the coverage was previously placed or the subsequent policy differs in any way from the previous policy, the Contractor shall also furnish replacement policy unless the Owner provides the Contractor with prior written consent to submit only a certificate of insurance for any such policy. All renewal and or replacement policies shall be in form and substance satisfactory to the Owner and written by carriers acceptable to the Owner.

§ 11.1.9 The Contractor shall cause each Subcontractor to (1) procure insurance in the amounts set for in Article 11 and (2) name the persons referenced in Section 11.1.1.1 as additional insureds under the Subcontractor's comprehensive

general liability policy. The additional insured endorsement included on the Subcontractor's comprehensive general liability policy shall state that coverage is afforded the additional insureds with respect to claims arising out of operations performed by or on behalf of the Contractor. If the additional insureds have other insurance which is applicable to the claims, such other insurance shall be on an excess or contingent basis. The amount of the insurance liability under this insurance policy shall not be reduced by the existence of such other insurance.

§ 11.1.10 Property insurance provided by the Owner shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, or other similar items commonly referred to as construction equipment which may be on the site and the capital value of which is not included in the work. The Contractor shall make its own arrangements for any insurance it might require on such construction requirement.

§ 11.1.11 The Contractor may carry whatever additional insurance he deems necessary to protect itself against hazards not covered for theft, collapse, water damage, materials and equipment stored on the site, and for materials and equipment stored off site, and against loss of owned or rented capital equipment and tools owned by mechanics or any tools, equipment, scaffolding, staging, towers and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the Work.

§ 11.1.12 All insurance coverage procured by the Contractor shall be provided by insurance companies having policy holder ratings no lower than "A-" and financial rating no lower than, "X" in the Best's Insurance guide, latest edition in effect as the date of the Contract and subsequently in effect at the time of the renewal of the policies required by the Contract Documents.

§ 11.1.13 If the Owner or the Contractor is damaged by the failure of the other party to purchase or maintain insurance required under Article 11, then the party who failed to purchase or maintain the insurance shall bear all reasonable costs (including attorney's fees and court and settlement costs) properly attributable thereto.

§ 11.1.14 The Contractor and Subcontractors must remove all "X, C & U" exclusions from their policies.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. Property insurance provided by the Owner shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items commonly referred to as construction equipment that may be on the site and the capital value of which is not included in the Work. The Contractor shall make its own arrangements for any insurance it may require on such construction equipment.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time

and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 INTENTIONALLY OMITTED

§ 11.4 INTENTIONALLY OMITTED

§11.5 INTENTIONALLY OMITTED

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time or Contract Sum.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If prior to the date of Substantial Completion, the Contractor, a Subcontractor or anyone for whom either is responsible, uses or damages any portion of the Work, including without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause each such item to be restored to "like new condition" at no expense to the Owner.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two-years after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

- .1 The obligations under Section 12.2 shall cover any repairs and replacement to any part of the Work or other property caused by the defective Work.
- .2 Upon completion of any work under or pursuant to Section 12.2., the two-year correction period in connection with the work requiring correction shall be renewed and recommenced.

§ 12.2.2.2 The two-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the two-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct Work which found to be defective or otherwise warranted within the two-year period, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. This paragraph relates exclusively to the knowing acceptance of nonconforming work by the Owner. It has no applicability to work accepted by the Owner, Construction Manager or Architect without the knowledge that such work fails to conform to the requirements of the Contract Documents.

§ 12.3.1 The Contractor and its Surety guarantee to make good, repair and/or correct, at no cost or expense to the Owner, any and all latent defects hereafter discovered, provided only that notice in writing, shall be given by the Owner to the Contractor within two years of the discovery of such defects.

- .1 This obligation shall survive the termination of any or all other obligation or obligations under the Contract Documents and it is agreed by the Contractor and its Surety that in the event the Owner is required to bring suit under this provision against the Contractor or its Surety to enforce this obligation, the contractor and its Surety hereby waive any defense of the status of limitations.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The governing law shall be the law of the State of New Jersey without respect to the conflict of law principles thereof. The parties consent to exclusive jurisdiction in the Superior Court of New Jersey venued in Salem County, New Jersey, unless claims fall under exclusive jurisdiction of federal courts and such claims shall be brought in the District Court of New Jersey, Camden Division.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 INTENTIONALLY OMITTED

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be cumulative and in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law or equity.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 The Owner shall provide and contract for "structural tests and special inspections" as required by the NJ DCA Bulletin 03-5. The Contractor shall coordinate, schedule, and provide on-site supervision and manpower to facilitate the testing. All other tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect and Construction Manager timely notice of when and where tests and inspections are to be made so that the Architect and Construction Manager may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor. The Construction Manager, Architect, Owner and Contractor shall be afforded a reasonable opportunity to attend, observe, and witness all inspections and tests of the Work. The Construction Manager, Architect or Owner may at any time request and receive from the Contractor satisfactory evidence that materials, supplies or equipment are in conformance with the Contract Documents. The Conduct of any inspection of test and the receipt of any approval shall not operate to relieve the Contractor from its obligations under the Contract Documents unless specifically so stated by Owner in writing.

§ 13.4.2 If the Architect, Owner, Construction Manager or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect and Construction Manager of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager and Architect's services and expenses, shall be at the Contractor's expense. The Contractor also agrees that the cost of testing services required for the convenience of the Contractor in his scheduling and performance of the Work and the cost of testing services related to remedial operations performed to correct deficiencies in the Work shall be borne by the Contractor.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect and Construction Manager.

§ 13.4.5 If the Architect or Construction Manager is to observe tests, inspections, or approvals required by the Contract Documents, the Architect and Construction Manager will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

§ 13.5.1 The Contractor shall not be entitled to any payment of interest for any reason, action or inaction by the Architect or the Owner unless required by law.

§ 13.5.2 Payments withheld for time delays, faulty materials, workmanship, or other failure to follow the Contract Documents shall not bear interest.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract in the manner provided in Subparagraph 14.1.2 only if the Project has been delayed in aggregate more than 100% of the total number of days scheduled for completion as a result of any combination of the following:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner, without cause, has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

§ 14.1.2 If the requirements of Section 14.1.1 are met, the Contractor may, upon fourteen (14) days written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment on the same basis as if Owner had terminated the Contract for convenience.

§ 14.1.3 If the Work is stopped for a period of 120 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.2.

§ 14.1.4 INTENTIONALLY OMITTED

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials and/or equipment;
- .2 repeatedly fails to make prompt payment to Subcontractors or suppliers as required by the Contract Documents;
- .3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- .4 is otherwise is guilty of substantial breach of a provision of the Contract Documents or disregards significant instructions of Architect or Owner (when such instructions are based on the requirements of the Contract Documents);
- .5 is adjudged bankrupt or insolvent, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or a receiver is appointed for Contractor or for any of its property, or files a petition to take advantage of any debtor's act, or to recognize under bankruptcy or similar laws;
- .6 breaches any warranty made by the Contractor under or pursuant to the Contract Documents;
- .7 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents;
- .8 fails after the commencement of the Work to proceed continuously with the construction and completion of the work for more than 10 days except as permitted under the Contract Documents;
- .9 repeatedly fails to maintain site cleanliness or site safety;
- .10 engages in any acts or omissions specifically identified as providing a basis for termination elsewhere in the Contract Documents; or
- .11 repeatedly fails to meet any other obligation of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor. The provision of notice hereunder does not provide the Contractor an opportunity to cure. If Owner terminates under this Section, it may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor; and
- .2 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the costs of finishing the Work, including compensation for the services of any consultants and the Architect and Construction Manager's services and expenses made necessary thereby, and the other costs and expenses identified hereinafter, exceed the unpaid balance of the Contract Sum, the contractor and its Surety shall pay the difference to the Owner upon demand. The costs of finishing the Work include, without limitation, all reasonable attorney's fees, additional title costs, insurance, additional interest because of any delay in completing the Work, the payment of replacement contractors, and all other direct and indirect consequential costs, including, without limitation, Liquidated Damages for untimely completion as specified in the Contract Documents, incurred by the Owner by reason of, or arising from, or relating to the termination of the Contractor as stated herein.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 INTENTIONALLY OMITTED

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 Payment for the Owner's termination for convenience shall be as set forth in the Agreement. The warranty and indemnity obligations of the Contractor and Surety shall survive and continue, notwithstanding any termination pursuant to this paragraph, with respect to the Work performed as of the date of termination.

§ 14.4.4 If Owner terminates the Contract for cause pursuant to Section 14.2 and it is subsequently determined that the Owner was not authorized or permitted to terminate the Contract as provided in Section 14.2, the Owner's termination shall be treated as a termination for convenience under this Section 14.4 and the rights and obligations of the parties shall be the same as if the Owner had issued a notice of termination to the Contractor under Section 14.4 rather than Section 14.2.

§ 14.5 In the event of the appointment of a trustee and/or receiver or any similar occurrence affecting the management of the account of the Contractor pertaining to the Work, it shall be the obligation of the Contractor, its representatives, receivers, sureties, or successors in interest to continue the progress of the Work without delay and specifically to make timely payment to Subcontractors and Suppliers of all amounts that are lawfully due them and to provide the Owner and all Subcontractors and Suppliers whose work may be affected with timely notice of the status of receivership, bankruptcy, etc., and the status of their individual accounts.

§ 14.6 Regularly scheduled job meetings shall be held at a location and time convenient to the Owner's representatives, the Architect and the Contractor. The Contractor shall attend such meetings or be represented by a person in authority who can speak for and make decisions for the Contractor.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility

to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of and within the period specified by applicable law. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.2.1 No act or omission by the Owner, Construction Manager or Architect, or by anyone acting on behalf of either shall be deemed or construed as a waiver or limitation of any right or remedy under the Contract Documents, or as an admission, acceptance, or approval with respect to any breach of the Contract or failure to comply with the Contract Documents by the Contractor, unless the Owner expressly agrees, in writing.

§ 15.1.2.2 The Owner's exercise, or failure to exercise, any rights, claims or remedies it may have arising out of or relating to the Contract documents shall not release, prejudice, or discharge the Owner's other rights and remedies, nor shall it give rise to any right, claim, remedy or defense by any other person, including the Contractor, its Surety, any Subcontractor, or any other person or entity.

15.1.2.3 Whenever possible, each provision of the Contract Documents shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of the Contract Documents, or portion thereof, is prohibited or found invalid by law, only such invalid provision or portion thereof shall be ineffective, and shall not invalidate or affect the remaining provision of the Contract Documents or valid portions of such provision, which shall be deemed severable. Further, if any provision of this Contract is deemed inconsistent with applicable law, applicable law shall control, and the provision shall be interpreted to the greatest extent possible in favor of the Owner.

§ 15.1.2.4 Contractor shall promptly pay to Owner all costs and reasonable attorney's fees incurred in connection with any action or proceeding in which Owner prevails, based on a breach of the Contract or other dispute arising out of or in connection with the Contract.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding five (5) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 15.1.3.3 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim including through litigation, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the resolution of the claim.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided herein shall be given to the Owner, Construction Manager and Architect before proceeding to execute the portion of the Work that is the subject of the Claim and within five (5) days after the occurrence of the event giving rise to such Claim for increase in the Construct Sum. The foregoing written notice shall contain a written statement from the Contractor setting forth in detail the nature and cause of the Claim and an itemized statement of the increase requested. No such written notice shall form the basis of an increase to the Contract Sum unless and until such increase has been authorized by a written Change Order executed and issued according to the terms and conditions set forth herein. The Contractor hereby acknowledges that the Contractor shall not have any right to and the Owner will not consider any requests for an increase in the Contract Sum that is not submitted in compliance with the foregoing requirements. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 8.3.2 shall be given. Said notice shall itemize all claims and shall contain sufficient detail and substantiating data to permit evaluation of same by Owner, Architect and Construction Manager. No such claim shall be valid unless so made. The Contractor's Claim shall include an estimate of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 INTENTIONALLY OMITTED

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor waive Claims against Owner for consequential damages arising out of or relating to this Contract. This waiver includes, but is not limited to, damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This waiver is applicable, without limitation, to all consequential damages due to Owner's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to litigation. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may file litigation unless mediation is specifically required by the Contract Documents. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party; (2) reject the Claim in whole or in part; (3) approve the Claim; (4) suggest a compromise; or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data; (2) advise the Initial Decision Maker when the response or supporting data will be furnished; or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to litigation and, if specifically required by the Contract Documents, mediation.

§ 15.2.6 In the event of a Claim against the Contractor, the Owner and Architect may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner and Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.6.1 INTENTIONALLY OMITTED

§ 15.2.7 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the claim by the Architect.

§ 15.2.8 INTENTIONALLY OMITTED

§ 15.3 INTENTIONALLY OMITTED

§ 15.4 INTENTIONALLY OMITTED

SECTION 01010 - SUMMARY OF WORK

1.1 GENERAL

- A. The Project consists of 2025 Pre-K Classroom Addition at the Paul W. Carleton School, 251 East Maple Avenue, Penns Grove, NJ 08069.
- B. Owner: Penns Grove Carneys Point Regional School District, 100 Iona Avenue, Penns Grove, New Jersey 08069.
- C. Contract Documents were prepared for the Project by Garrison Architects, 713 Creek Road, Bellmawr, NJ 08031
- D. The Work includes but is not limited to the following: (see the construction documents for details):
 - 1. The Contractors are strongly encouraged to verify all existing conditions, dimensions and areas prior to submitting a responsive / responsible bid. Site visits can be arranged through the Maintenance and Grounds Supervisor, Kevin Tocco, phone number is (609) 299-6300 ext. 3044, cell phone (856) 469-5455.
 - 2. Contractors are strongly encouraged to visit the site of the Project before submitting costs for the project. Such site visit shall be for the purpose of familiarizing the Contractor with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, including all existing site conditions, access to the site, physical characteristics of the site and surrounding areas.
 - 3. The Contractor shall provide one (1) full-time onsite Superintendent who is present for all work at all times including, but not limited to, subcontractor work. The Superintendent is responsible for maintaining a daily log and verifying the security clearance of all personnel onsite and all other responsibilities outlined in the Specifications. The Superintendent shall coordinate and supervise, not be performing the work.
 - 4. The Contractor is to provide a list to the Construction Manager with the names of all personnel on site, each day, and no later than two hours after the work has commenced or by 9:00 AM every day via email.
 - 5. During the complete duration of the Work, the Contractor must maintain the continued operation and function of all services and systems including, but not limited to, fire alarm, data, network, information technology, security, audio visual, public address, electrical and HVAC. If a disruption to a system occurs, the Contractor must immediately take all actions necessary to restore the system at the earliest possible time. Any required shutdown of any system needs to be coordinated and scheduled with the Owner at times when school is not in session.
 - 6. This work is scheduled to occur during periods of time when weather protection will be required. The Contractor is responsible for all weather related protection required to ensure that the work will continue uninterrupted until completion.
 - 7. LOOSE FURNITURE, EQUIPMNET AND PERSONAL ITEMS: Unless noted otherwise, Owner shall be responsible to remove loose furniture, equipment and personal items from areas of work as needed to facilitate scheduled renovations. The Owner will work expediently to prioritize specific areas with the Contractor but may take up to five (5) calendar days after the last day of school to remove all items completely.

SECTION 01010 - SUMMARY OF WORK

8. Where ceilings are replaced, temporarily support all existing ceiling mounted devices. Bundle and tie loose wire prior to reinstalling devices on the new ceiling assembly. Fire alarm detection devices shall be relocated to the highest point possible under the structural roof deck. Cameras shall be adjusted such that they continue to provide coverage of intended areas.
9. Dispose of material according to state and local code and Section 01524 – Construction Waste Management.
10. Field verify existing conditions, exact dimensions of existing rooms and openings, etc. The dimensions shown on the bidding documents are approximate and provided for preliminary reference only.
11. Record all necessary existing conditions, adjust exact materials and methods as required and submit via shop drawings for Architect's review within 45 days of Notice of Award.
12. Provide final clean up in each room to include removal of all debris, dust, dirt and stains on all affected walls, floors and other surfaces on a daily basis. Glass or other dangerous items will not be tolerated if left at a completed area.
13. Coordinate installation so that safe egress from the building is maintained at all times.
14. Utilities must remain in service at all times. The Contractor will be responsible for all resulting costs should they fail to comply with this requirement.
15. Restore all grades, lawns, concrete curbing, sidewalks, asphalt, and pavement to pre-construction condition.
16. The Contractor shall locate all subsurface wires, cables, pipes and pipeline in the work area prior to construction. See General conditions Section 2.2.3 for additional information.
17. The work shall include:
 - a. **Site Work** – This Project includes site improvements related to the proposed building addition and will include but is not limited to, earthwork, potential soil replacement, utility and stormwater improvements, asphalt construction and reconstruction, curbing, sidewalks, retaining walls and a new playground. Construction of a ramp shall be included but refer to architecture plans for details. All improvements include the necessary restoration where construction activities have taken place. This project will also include 3 Alternates. Alternate #2 and Alternate #3 pertain to Site Work. Alternate #2 is for construction of a new parking lot with utility and stormwater improvements, and Alternate #3 is for purchase and installation of a shade structure near the playground. See Site Drawings for details.
 - b. **General Construction Work** – The project work includes providing a new twelve (12) classroom addition with support spaces to the existing school. Each classroom includes its own toilet room. Support spaces include. Front office, two (2) additional offices, nurses' room, faculty room, and mechanical and storage rooms. Included with the work is to tie into the existing school and convert a storage room to a smaller storage room and a sensory separation room. See Drawings for details.
 - c. **Mechanical Construction Work** – The Project work includes two (2) new variable volume rooftop units with hot water heating coils and VAV boxes fed from a new hot water heating boiler system with new pumps and piping serving the spaces within the addition. Other mechanical equipment includes exhaust fans and hydronic heaters. The Contractor shall integrate all new equipment into the facility's Building Management Control System.

SECTION 01010 - SUMMARY OF WORK

- d. **Plumbing Construction Work** – The Project work includes all items required to construct fourteen (14) single occupant toilet rooms as part of the new addition including a new domestic hot water heater. As part of the new addition, the existing gas service under the new addition shall be removed and new underground gas piping shall be installed to avoid the new addition. Additionally, a new gas connection is to be made and piping provided for a new hot water heating boiler in the existing mechanical room.
- e. **Fire Detection / Alarm System Work** – See the Drawings and Specifications for the detailed Scope of Work.
- f. **Electrical Construction Work** – See the Drawings and Specifications for the detailed Scope of Work.

A. Schedule of work sequence:

- 1. No work on site can be started until all permits are received. The existing school must be completely operational during the school year. **The overall project completion date is May 29, 2026. The Milestone Schedule is as follows:**

Phase 1: On site construction can commence as soon as permits are received. Prior to Summer Recess the onsite schedule shall be coordinated with the Construction Manager / Owner and cannot disrupt the school building's operations or egress. Completion of phase 1 is August 21, 2025. Phase 1 includes but is not limited to: Demolition, temporary egress measures, refeeding of the existing pad mounted transformer from adjacent property, removal and rerouting of feeders for panels DP1 and DP2, rerouting gas services, boiler installation and site preparation. See Construction Documents for details. See drawing A-0.3 and A-04 for temporary egress measures.

Phase 2: All remaining Work. Phase 2 can commence once the temporary egress measures are in place.

- 2. All construction preparation work, project startup, submittals, schedules, approvals, procurement, coordination and other preparatory tasks must commence immediately upon receipt of the Notice to Proceed or the date of the fully executed Owner/Contractor Contract, whichever comes first. The Awarded Contractor must be fully prepared to deliver and install all materials and equipment for Phase 1 work.
- 3. All tie-in work to integrate into the existing building's systems shall be completed during Second Shift hours, weekends, holidays or Summer of 2025. Class hours on each school day are from 7:00 A.M. to 3:30 P.M. unless noted otherwise on the school calendar as a half day (hours may vary per school building). No activities generating excessive or unreasonable noise and/or vibrations will be permitted during school hours. The Owner reserves the right to stop disruptive activities at any time during Class hours.

B. The Work will be constructed under one lump sum prime contract.

SECTION 01010 - SUMMARY OF WORK

- C. Cooperate with the separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. If roof replacement work is being conducted simultaneously, no work can take place under the roofing operations. The Work under this contract will need to coordinate and adjust their areas of Work and the Owner's activities.
- D. Contractor Use of Premises: During construction the Contractor shall be limited to the immediate areas of Work. The Contractor shall coordinate access to the existing building directly with the Owner. **No unauthorized entry will be permitted.**
- E. Use of the Site: Limit use of premises to the areas of work. Do not disturb portions of the site beyond the areas indicated. Areas which will be disturbed shall also be fenced in during construction. All construction traffic shall be stopped during **STUDENT ARRIVAL AND DISMISSAL TIMES** for school bus operating time during every school day which is subject to change. All other times during the school day, the construction traffic will operate with extra precaution to avoid conflict with school operations and public traffic.
 - 1. The Contractor will have full use of areas within designated "Contract Limits" for performance of the work of this contract, including storage and staging.
 - 2. Access to other areas of the building will not be allowed except as required and specifically authorized in advance to complete individual items of work under this contract. Where so authorized, restrict access to the immediate area of work and only for the time it takes to complete the items of work.
 - a. When it is necessary to perform work within the occupied portion of the building, the Contractor shall first advise the Owner at least 48 hours prior to the requested time so that security precautions can be made. This applies to all weekends (Saturday and Sunday).
 - b. Provide daily cleaning of facilities; restore any damage at completion of the specific item of work to the complete satisfaction of the Owner's Representative.
 - c. Remove all ladders, tools scaffolding, equipment and material at the completion of the specific item of work, at the end of each day, and which may interfere with scheduled activities.
 - 3. Allow for Owner occupancy and use by the public. Provide construction fencing and non-combustible safety barriers for students, faculty and the public.
 - 4. Keep driveways and entrances clear. Do not use these areas for parking or material storage. Schedule deliveries to minimize on-site storage of materials and equipment.
 - 5. All oversized deliveries must be scheduled in coordination with the Owner / Construction Manager. Site limitations during school hours restrict maneuvering of oversized (tractor trailer) vehicles.
 - 6. It is the Contractor's responsibility to provide safe, protected egress from all existing exits from the existing building as directed by the Building Official and the Fire Marshal.

SECTION 01010 - SUMMARY OF WORK

7. Contractor's personnel are not permitted to wear on-site any clothing with wording or graphics that may be construed as offensive, profane or obscene; with wording, graphics or advertising for tobacco or alcoholic products, or attire that appears provocative. The Owner, Construction Manager and/or principal of the school will be the sole judge of what is appropriate or inappropriate. Anyone not conforming to this requirement will be immediately removed from the building. **This is a zero tolerance policy.**
 8. Verbal and visual comments to the school staff, students or anyone other than by the Construction Manager will not be tolerated and will be cause for removal from the site. **This is a zero tolerance policy.**
 9. The use of drugs, cannabis, tobacco or alcohol anywhere on the grounds or in the building will not be permitted and will be cause for removal from the site.
 10. The use of radios will not be permitted at any time.
 11. Powder actuated fasteners will not be permitted without prior authorization by the Construction Manager when school is not in session.
- F. Provide temporary construction fencing to completely encompass areas that would be disturbed during construction, including areas where material will be stored. The fencing must completely surround all construction areas and material storage areas. Provide, "NO TRESPASSING" signs on all construction fencing at intervals of 40 feet on center or closer.
- G. Perform weekly mowing, weed whacking, cleaning and maintenance inside all construction staging areas until the fencing is removed.
- H. Use of the Existing Building: Maintain building weather tight. Repair damage caused by construction. Protect the building and its occupants during construction.
- I. Full Owner Occupancy: The Owner will occupy the site and existing building during construction. Cooperate with the Owner to minimize conflicts and facilitate Owner usage. Do not interfere with the Owner's operations. The Owner will partially occupy the buildings during the summer for summer programs.
- J. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion. Placing equipment and partial occupancy do not constitute acceptance of the Work.
1. The Architect will prepare a Certificate of Substantial Completion after the Contractor obtains a Certificate of Occupancy from Building Officials for each portion of Work occupied prior to Owner occupancy.
 2. Mechanical and Electrical systems shall be operational and required inspections and tests completed prior to partial Owner occupancy. Upon occupancy, the Owner will operate and maintain systems serving occupied portions of the building.
 3. The Owner will be responsible for maintenance and custodial service for occupied portions of the building.
- K. Owner – Furnished Products: The Owner may furnish some products for the contractor to install including (but not limited to) toilet accessories. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.

SECTION 01010 - SUMMARY OF WORK

1. If items are damaged, defective, or missing, the Owner will arrange for replacement.
 2. The Contractor shall designate delivery dates in the Contractor's Construction Schedule.
 3. The Contractor shall provide support blocking and related systems as needed for proper installation as recommended by the product manufacturer.
 4. The Contractor is responsible for receiving, unloading, and handling Owner-furnished items at the site.
 5. The Contractor is responsible for protecting items from damage, including exposure to the elements. The Contractor shall repair or replace items damaged as a result of its operations.
- L. Fees, Permits and Taxes: The Contractor is advised that a Building Permit is required for this project. The plans have been submitted to the Construction Official. Upon contract award, it shall be the responsibility of the **Contractor** to secure all required permits. It shall be the **Owner's** responsibility to pay for all fees and permit costs if required. It shall be the **Contractor's** responsibility to pay for all fees and permit costs for the jobsite trailer if required.
- M. **SAFETY:** The Contractor is responsible for providing and enforcing all safety onsite and conform with all OSHA regulations, codes and standards. The Owner, Construction Manager, Clerk of the Works and Architect have no responsibility to provide for the safety or protection of the trades. The Contractor shall submit a site specific Emergency Action Safety Plan and review this with all onsite personnel. The Contractor shall conduct periodic (as needed at least one a month) site safety inspections and issue a report on the conditions. The Contractor shall maintain a first aid kit onsite. For further Contractor responsibilities with respect to safety, refer to article 10 of the General Conditions of the Contract for Construction.
- N. The Contractor shall not use any product containing asbestos and all plumbing **shall** be lead free. The Contractor shall provide a notarized letter stating: "No asbestos containing materials were provided on the project and the plumbing is lead free".
- O. **The Contractor is required to have all long lead items in fabrication and provide proof from the manufacturer within (45) days of the award of the contract. The** Owner will pay for stored material in accordance with the General Conditions. Delays caused by the failure of the Contractor to adhere to this requirement will not be cause for a time extension.
1. Supply Chain Shortages: Due to the ongoing supply chain shortages, the Contractor will be required to do the following:
 - a. Once a purchase order has been issued or the Contract has been signed, the Contractor shall order ALL materials ASAP.
 - b. The materials must be stored in a secured location, out of the weather and within acceptable storage temperatures. The cost of this material handling is to be included in the project cost.

SECTION 01010 - SUMMARY OF WORK

- P. Provide a 4' x 8' plywood Construction Identification Sign. The sign shall have 4x4 posts and be three (3) colors. The graphics for the project sign will be provided. Engage an experienced sign painter to apply the graphics.

END OF SECTION 01010

PENNS GROVE-CARNEYS POINT REGIONAL SCHOOL DISTRICT SCHOOL CALENDAR

2024-2025

SEPTEMBER 24

M	T	W	Th	F
2	3*	4*	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30				

OCTOBER 24

M	T	W	Th	F
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30	31	

NOVEMBER 24

M	T	W	Th	F
				1
4	5	6*	7	8
11	12	13	14	15
18	19	20	21	22
25	26	27	28	29

DECEMBER 24

M	T	W	Th	F
2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30	31			

JANUARY 25

M	T	W	Th	F
		1	2	3
6	7	8	9	10
13	14	15	16	17
20	21	22	23	24
27*	28	29	30	31

Sept. 2 Labor Day – School Closed
 Sept. 3-4 Staff In-Service
 Sept. 5 School Opens – Students
 Oct. 14 Columbus/Indigenous People’s Day
 Nov. 6 Staff In-Service
 Nov. 7-8 NJEA Convention
 Nov. 11 Veterans Day Observed
 Nov. 27 Early Dismissal
 Nov. 28-29 Thanksgiving Holiday
 Dec. 3-5 Gr. 6-8 Only Parent Teacher Conference
 Dec. 17-19 Gr. PreK-5 Only Early Dismissal Parent Teacher Conference
 Dec. 20 Early Dismissal
 Dec. 23-31 Winter Recess

Jan. 1 New Year’s Day Holiday
 Jan. 20 Dr. Martin L. King, Jr. Day
 Jan. 27 County In-Service
 Feb. 14-17 President’s Weekend
 Mar. 25-27 Gr. PreK-5 Only Early Dismissal Parent Teacher Conference
 Apr. 17 Early Dismissal
 Apr. 18 Spring Recess
 Apr. 21-22 Spring Recess
 Apr. 29, 30 and May 1 Gr. 6-8 Only Early Dismissal Parent Teacher Conference
 May 16 Staff In-Service
 May 26 Memorial Day
 June 11-17 Early Dismissal
 June 17 Last Day for Students

PUPIL ATTENDANCE DAYS

Sept.	18	Feb.	18
Oct.	22	March	20
Nov.	15	April	19
Dec.	15	May	20
Jan.	21	June	12

Total Projected Student Days 180

FEBRUARY 25

M	T	W	Th	F
3	4	5	6	7
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28

MARCH 25

M	T	W	Th	F
3	4	5	6	7
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28
31				

APRIL 25

M	T	W	Th	F
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30		

MAY 25

M	T	W	Th	F
			1	2
5	6	7	8	9
12	13	14	15	16*
19	20	21	22	23
26	27	28	29	30

JUNE 25

M	T	W	Th	F
2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30				

Emergency Closure: Please do not schedule any event that would necessitate your absence from school during the months of April and June in the event we would have to extend school due to snow/emergency closings. Should it be necessary to extend the school year, or reschedule dates, approval for requested leaves will not be granted. Please note that there are no snow days built into the calendar.



Early Dismissal



School Closed for Students



Staff In-Service

SECTION 01040 – COORDINATION

1.1 GENERAL

- A. This Section includes requirements for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. Coordination drawings and Specifications with all subcontractors.
 - 2. Administrative and supervisory personnel.
 - 3. Cleaning and protection is the responsibility of the Contractor.

1.2 COORDINATION

- A. Coordinate construction to assure efficient and orderly installation of each part of the Work. Coordinate operations that depend on each subcontractor for proper installation, connection, and operation. The Contractor shall be responsible for the following:
 - 1. Schedule operations in the sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
 - 4. Coordination with the school for furniture and equipment which shall be relocated to new facilities.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and his contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Delivery and processing of submittals.
 - 3. Progress meetings.
 - 4. Project closeout activities.
- D. Conservation: Coordinate construction to assure that operations are carried out with consideration for conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not incorporated in, the Work.
- E. Coordination Drawings: Prepare coordination drawings for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.

SECTION 01040 – COORDINATION

1. Show the relationship of components shown on separate shop drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."

F. Staff Names: **The Contractor shall** Within 7 days of commencement of construction, submit to the Construction Manager a list of the Contractor's staff assignments, including the superintendent and other personnel at each Project Site. Identify individuals and their responsibilities. List their telephone numbers.

1. Post copies in the Project meeting room, the temporary field office, and each temporary telephone.

1.3 PRODUCTS (Not Applicable)

1.4 EXECUTION

- A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.
- B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.
- C. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage.
- D. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- E. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:
1. Excessive static or dynamic loading.
 2. Excessive internal or external pressures.
 3. Excessively high or low temperatures.
 4. Water or ice.
 5. Solvents and chemicals.
 6. Abrasion.
 7. Soiling, staining, and corrosion.
 8. Combustion.
 9. Excessive dust.

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

1.1 GENERAL

- A. Cutting and Patching Proposal: The Contractor shall be responsible for arranging and providing the necessary cutting and patching that is required to furnish and install all work connected with this project. The Contractor shall submit a proposal describing procedures in advance of the time cutting and patching will be performed. Request approval from the Owner / Architect before proceeding. Include the following:
1. Describe extent of cutting and patching. Show how it will be performed and indicate why it cannot be avoided.
 2. Describe changes to existing construction. Include changes to structural elements and operating components and changes in the building's appearance and other significant visual elements.
 3. List products to be used and firms that will perform Work.
 4. Indicate dates when cutting and patching will be performed.
 5. Utilities: List utilities that will be disturbed or relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. Arrange utility work during the Summer for minimum impact to the Schools' normal functions.
 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
 7. Approval to proceed does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.
- B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
1. Obtain approval before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Existing exterior door system
 - c. Bearing and retaining walls
 - d. Existing roof system
- C. Operational Limitations: Do not cut and patch operating elements in a manner that would reduce their capacity to perform as intended. Do not cut and patch operating elements in a manner that would increase maintenance or decrease operational life or safety.
1. Obtain written approval before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Fire protection systems.
 - c. Electrical wiring systems.
 - d. Water and sewer systems.
 - e. H.V.A.C. systems.
 - f. Cutting and patching work which affects the operation of the school must be performed after 3:00 P.M. or before 7:30 A.M. so as not to interfere with the schools' operations.
 - g. Security System.
 - h. Computer System.
 - i. Telephone and Cable TV System.

SECTION 01045 - CUTTING AND PATCHING

- D. Visual Requirements: Do not cut and patch exposed construction in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.
- E. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged in such a manner as not to void warranties.

1.2 PRODUCTS

- A. Use materials that visually match adjacent surfaces to the fullest extent possible. Use materials whose performance will equal that of existing materials.

1.3 EXECUTION

- A. Examine surfaces to be cut and patched and conditions under which work is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action.
 - 1. Before proceeding, meet with parties involved. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect existing construction to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Avoid cutting pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.
- F. Performance: Employ skilled workmen. Proceed at the earliest feasible time and complete without delay.
 - 1. Cut construction to install other components or perform other construction and subsequent fitting and patching required to restore surfaces to their original condition.
- G. Cutting: Cut using methods that will not damage elements retained or adjoining construction. Comply with the original Installer's recommendations.
 - 1. Use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

SECTION 01045 - CUTTING AND PATCHING

2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
 5. Where services are required to be removed, relocated, or abandoned, by-pass utility services before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- H. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove floor and wall coverings and replace with new materials to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch after the area has received primer and second coat.
 4. Patch, repair, or rehang ceilings as necessary to provide an even-plane surface of uniform appearance.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar items. Clean piping, conduit, and similar features before applying paint or finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050 - FIELD ENGINEERING

1.1 GENERAL

- A. This Section specifies requirements for field-engineering services including, but not limited to, the following:
 - 1. Civil-engineering services.
 - 2. Geotechnical: Conduct monitoring, testing and inspection work during construction.
 - 3. Surveying.
- B. Submit a certificate certifying location and elevation of improvements.
- C. Project Record Documents: Submit a record of Work performed and record survey data.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

- A. Verify layout information, in relation to property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without written approval. Report destroyed reference points or requirements to relocate reference points because of changes in grades.
 - 2. Replace destroyed Project control points. Base replacements on the original survey control points.
- B. Establish and maintain a minimum of 2 permanent benchmarks.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Existing Utilities: The existence of underground utilities and construction is not guaranteed. Verify location of underground utilities and other construction before beginning sitework.
 - 1. Prior to construction, verify location and invert elevation at points of connection of sanitary and storm sewers, and water-service piping.
- D. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and to locate each element. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every element for line, level, and plumb.
- E. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.

SECTION 01050 - FIELD ENGINEERING

1. Record deviations from lines and levels. Advise the Architect when deviations exceed tolerances. On Project Record Drawings, record deviations that are accepted and not corrected.
 2. On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- F. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.
- G. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.
- H. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01050

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

1.1 GENERAL

- A. Definitions: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated refers to graphic representations, notes, or schedules on the Drawings, paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. Location is not limited.
- C. Directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.
- D. Approved, when used in conjunction with the Architect's action on submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations include laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install describes operations at the Project Site including unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide means to furnish and install, complete and ready for the intended use.
- I. Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term experienced, when used with the term Installer, means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authorities having jurisdiction.
- J. Project Site is the space available for performing construction activities, either exclusively or in conjunction, with others performing work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. Testing Agency is an independent entity engaged by the Owner to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

1. Abbreviated Language: Language used in Specifications is abbreviated. Implied words and meanings shall be interpreted as appropriate. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative and streamlined language is used. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.
- M. Abbreviations and Names: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States.
1. AABC - Associated Air Balance Council; www.aabc.com.
 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
 12. AGA - American Gas Association; www.aga.org.
 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 15. AI - Asphalt Institute; www.asphaltinstitute.org.
 16. AIA - American Institute of Architects (The); www.aia.org.
 17. AISC - American Institute of Steel Construction; www.aisc.org.
 18. AISI - American Iron and Steel Institute; www.steel.org.
 19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
 21. ANSI - American National Standards Institute; www.ansi.org.
 22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
 23. APA - APA - The Engineered Wood Association; www.apawood.org.
 24. APA - Architectural Precast Association; www.archprecast.org.
 25. API - American Petroleum Institute; www.api.org.
 26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
 27. ARI - American Refrigeration Institute; (See AHRI).
 28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
 29. ASCE - American Society of Civil Engineers; www.asce.org.

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformance Européenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csagroup.com.
65. CSA - CSA International; www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).

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74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsintitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. ICBO - International Conference of Building Officials; (See ICC).
101. ICC - International Code Council; www.iccsafe.org.
102. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
103. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
104. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
105. IEC - International Electrotechnical Commission; www.iec.ch.
106. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
107. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
108. IESNA - Illuminating Engineering Society of North America; (See IES).
109. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
110. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
111. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
112. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
113. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
114. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
115. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).

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116. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
117. ISO - International Organization for Standardization; www.iso.org.
118. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
119. ITU - International Telecommunication Union; www.itu.int/home.
120. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
121. LMA - Laminating Materials Association; (See CPA).
122. LPI - Lightning Protection Institute; www.lightning.org.
123. MBMA - Metal Building Manufacturers Association; www.mbma.com.
124. MCA - Metal Construction Association; www.metalconstruction.org.
125. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
126. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
127. MHIA - Material Handling Industry of America; www.mhia.org.
128. MIA - Marble Institute of America; www.marble-institute.com.
129. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
130. MPI - Master Painters Institute; www.paintinfo.com.
131. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
132. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
133. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
134. NADCA - National Air Duct Cleaners Association; www.nadca.com.
135. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
136. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
137. NBI - New Buildings Institute; www.newbuildings.org.
138. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
139. NCMA - National Concrete Masonry Association; www.ncma.org.
140. NEBB - National Environmental Balancing Bureau; www.nebb.org.
141. NECA - National Electrical Contractors Association; www.necanet.org.
142. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
143. NEMA - National Electrical Manufacturers Association; www.nema.org.
144. NETA - InterNational Electrical Testing Association; www.netaworld.org.
145. NFHS - National Federation of State High School Associations; www.nfhs.org.
146. NFPA - National Fire Protection Association; www.nfpa.org.
147. NFPA - NFPA International; (See NFPA).
148. NFRC - National Fenestration Rating Council; www.nfrc.org.
149. NHLA - National Hardwood Lumber Association; www.nhla.com.
150. NLGA - National Lumber Grades Authority; www.nlga.org.
151. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
153. NRCA - National Roofing Contractors Association; www.nrca.net.
154. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
155. NSF - NSF International; www.nsf.org.
156. NSPE - National Society of Professional Engineers; www.nspe.org.
157. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
158. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
159. NWFA - National Wood Flooring Association; www.nwfa.org.
160. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
161. PDI - Plumbing & Drainage Institute; www.pdionline.org.

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162. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
163. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
164. RFCI - Resilient Floor Covering Institute; www.rfci.com.
165. RIS - Redwood Inspection Service; www.redwoodinspection.com.
166. SAE - SAE International; www.sae.org.
167. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
168. SDI - Steel Deck Institute; www.sdi.org.
169. SDI - Steel Door Institute; www.steeldoor.org.
170. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
171. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SIA - Security Industry Association; www.siaonline.org.
173. SJI - Steel Joist Institute; www.steeljoist.org.
174. SMA - Screen Manufacturers Association; www.smainfo.org.
175. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
176. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
177. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
178. SPIB - Southern Pine Inspection Bureau; www.spib.org.
179. SPRI - Single Ply Roofing Industry; www.spri.org.
180. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
181. SSINA - Specialty Steel Industry of North America; www.ssina.com.
182. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
183. STI - Steel Tank Institute; www.steeltank.com.
184. SWI - Steel Window Institute; www.steelwindows.com.
185. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
186. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
187. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
188. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
189. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
190. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
191. TMS - The Masonry Society; www.masonrysociety.org.
192. TPI - Truss Plate Institute; www.tpinst.org.
193. TPI - Turfgrass Producers International; www.turfgrassod.org.
194. TRI - Tile Roofing Institute; www.tilerroofing.org.
195. UL - Underwriters Laboratories Inc.; www.ul.com.
196. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
197. USAV - USA Volleyball; www.usavolleyball.org.
198. USGBC - U.S. Green Building Council; www.usgbc.org.
199. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
200. WA - Wallcoverings Association; www.wallcoverings.org.
201. WASTEC - Waste Equipment Technology Association; www.wastec.org.
202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
205. WI - Woodwork Institute; www.wicnet.org.

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206. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
207. WWPA - Western Wood Products Association; www.wwpa.org.

N. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

O. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

P. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

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1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a) Available from Defense Standardization Program; www.dsp.dla.mil.
 - b) Available from General Services Administration; www.gsa.gov.
 - c) Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
 6. MILSPEC - Military Specification and Standards; (See DOD).
 7. USAB - United States Access Board; www.access-board.gov.
 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- Q. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

END OF SECTION 01095

SECTION 01200 - PROJECT MEETINGS

1.1 GENERAL

- A. It is the responsibility of the Construction Manager (CM) to set up, run and record the minutes for the meetings.
- B. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Preconstruction conferences.
 - 2. Preinstallation conferences.
 - 3. Progress meetings.
- C. Preconstruction Conference: A preconstruction conference shall be scheduled before starting any construction to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of the Owner, CM, Architect, and their consultants; the Contractor and his superintendent; major subcontractors; and other concerned parties shall attend.
 - a. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing.
 - c. Submittal of Shop Drawings, Product Data, and Samples.
 - d. Use of the premises.
 - e. Product delivery dates.
 - f. Job site safety.
- D. Preinstallation Conferences: The CM shall conduct a preinstallation conference before the beginning of each phase of work and with each subcontractor prior to that subcontractor's beginning on-site work.
 - 1. Attendees: The Installer, CM, the Contractor, the Subcontractors related to the work, and representatives of manufacturers and fabricators involved in or affected by the installation shall attend.
 - a. Review the progress of other operations and preparations for the activity under consideration at each preinstallation conference, including requirements for the following:
 - 1) Compatibility problems and acceptability of substrates.
 - 2) Time schedules and deliveries.
 - 3) Manufacturer's recommendations.
 - 4) Warranty requirements.
 - 5) Inspecting and testing requirements.
 - b. The CM shall record significant discussions and agreements and disagreements, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

SECTION 01200 - PROJECT MEETINGS

- c. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve problems and reconvene the conference.
- E. Progress Meetings: The CM shall conduct progress meetings at the construction site every two weeks. The Contractor will notify the GC, Owner, the Architect and all subcontractors of scheduled dates. Coordinate meeting dates with preparation of the payment request. It is the Owner/CM /Architect's option to require weekly job site coordination meetings at each job site in addition to the bi-weekly progress meeting.
1. Attendees: The Owner, CM, Architect, Contractor, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to the Work.
- F. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for discussion appropriate to Project status.
1. Contractor's Construction Schedule: The Contractor shall review the progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule. Determine how to expedite construction behind schedule; secure commitments from parties involved to do so. Discuss revisions required to insure subsequent activities will be completed within the Contract Time.
 2. Review the present and future needs of each entity present, including the following:
 - a. Time.
 - b. Sequences.
 - c. Status of submittals.
 - d. Deliveries and off-site fabrication problems.
 - e. Temporary facilities and services.
 - f. Quality and work standards.
 - g. Change Orders.
 - h. Coordinate with school schedule and programs.
 3. Reporting: Distribute meeting minutes to each party present and to parties who should have been present. Include a summary of progress since the previous meeting and report.
 4. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. A Lump Sum Amount is specified in this Section of the Contract Documents. This amount shall be included as a separate line item in the Schedule of Values for the Project.
- B. Related Sections:
 - 1. Unit Prices found on the Bid Form.
 - 2. A201 General Conditions of the Contract for procedures for submitting and handling Change Orders.
 - 3. Divisions 2 through 16 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, the Contractor shall advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At the Architect's request, the Contractor shall provide a Change Order proposal for additional work to be deducted from the allowance. Include recommendations that are relevant to performing the Work. The Change Order Proposal shall include all material and labor with sufficient breakdown for review.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in the Cash Allowance, in the form specified for Change Order Requests.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

SECTION 01210 - ALLOWANCES

1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 CASH ALLOWANCES (Overhead and profit are permitted totaling a maximum of 15% per the AIA Contract. Supervision, bond and insurance are not permitted)

- A. Cash Allowance shall be used only as directed and approved by the Architect for the Owner's purposes.
- B. The Change Order Request format shall be used to request authorization for use of funds from the Cash Allowance. The Contractor's overhead and profit margins are fixed to a maximum of 15% per the AIA Contract. The Contractor is not permitted to charge for additional supervision, bond and insurance as these costs are included in the Base Contract Sum.
- C. At Project closeout, the contractor shall provide a full credit for unused amounts remaining in the Cash Allowance to the Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Provide a \$150,000.00 cash allowance.
- B. **SOIL REPLACEMENT ALLOWANCE:** Include an allowance for 200 **CY** of SOIL REPLACEMENT. This allowance is calculated by taking Unit Price #1 on the Bid Form and multiplying this sum by 200 **CY**. Specification section "Bid Form" requires Unit Price #1 for this item, which shall include all necessary and incidental costs related to the scope of this work. Following completion of the work, a contract sum increase or decrease from the 200 **CY** allowance will be determined based on Unit Price #1.

END OF SECTION 01210

SECTION 01300 – SUBMITTALS

1.1 GENERAL

- A. The Contractor shall use the enclosed Cover Page form for **every copy** of every shop drawings submitted with the exception of full size drawings that have a title block for custom or project specific materials or systems. The Contractor's Cover Page form shall be signed by the Project Manager with an original signature indicating that the information has been reviewed and coordinated.
- B. Submittal Procedures: Coordinate submittal and preparation with construction, fabrication, other submittals, and activities that require sequential operations with all Subcontractors . Transmit in advance of construction operations to avoid delay.
1. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
 2. Processing: Allow 2 weeks for initial review. Allow more time if the Architect must delay processing to permit coordination with other trades or Owner's contractors. Allow 2 weeks for reprocessing.
 - a. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
 - b. **All Shop Drawings, product data and samples shall be submitted within forty-five (45) days of Notice of Award. No Payments will be approved if the Shop Drawings process is not completed within this time schedule.**
 - c. **Substitution submittals shall be made no later than 30 days after Notice to Proceed in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products. No Substitutions will be considered after 30 days.**
- C. Contractor's Construction Schedule: Prepare a horizontal bar-chart-type, contractor's construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first working day of each week. Use the same breakdown of Work indicated in the "Schedule of Values." Indicate estimated completion in 10 percent increments. As Work progresses, mark each bar to indicate actual completion.
1. Submit within 14 days of the date established for "Commencement of the Work."
 2. Prepare the schedule on stable transparency, or other reproducible media, of width to show data for the entire construction period.
 3. Secure performance commitments from parties involved. Coordinate each element with other activities; include minor elements involved in the Work. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
 4. Coordinate with the Schedule of Values, list of subcontracts, Submittal Schedule, payment requests, and other schedules.

SECTION 01300 – SUBMITTALS

5. Indicate completion in advance of Substantial Completion. Indicate Substantial Completion to allow time for the Architect's procedures necessary for certification of Substantial Completion.
 6. Phasing: Show how phased completion affects the Work.
 7. Work Stages: Indicate important stages for each portion of the Work.
 8. Area Separations: Provide a separate time bar to identify each construction area for each portion of the Work. Indicate where each element must be sequenced with other activities.
- D. The Contractor shall receive the schedule from each Subcontractor. The Contractor shall coordinate with all Subcontractors and prepare an overall construction schedule in five (5) days to submit to the Owner / Architect for approval.
- Submittal Schedule: After developing the Contractor's Construction Schedule, prepare a schedule of submittals.
1. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Date for first submittal.
 - b. Related details on drawings.
 - c. Related Section number in the Specifications.
 - d. Submittal category (Shop Drawings, Product Data, or Samples).
 - e. Name of the subcontractor.
 - f. Description of the Work covered.
 - g. Date for the Architect's final approval.
 3. Schedule Distribution: Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.
 - a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.
 - b. Updating: Revise the schedule after each meeting or activity where revisions have been made. Issue the updated schedule concurrently with the report of each meeting.
- E. Daily Construction Reports: The Contractor shall prepare a daily report recording events at the site and submit copies to the Owner, Construction (if applicable) and Architect on a monthly basis or upon request. Include the following information:
1. List of subcontractors at the site.
 2. High and low temperatures, general weather conditions.
 3. Accidents and unusual events.
 4. Stoppages, delays, shortages, and losses.
 5. Meter readings and similar recordings.
 6. Emergency procedures.

SECTION 01300 – SUBMITTALS

7. Orders and requests of governing authorities.
 8. Services connected, disconnected.
 9. Equipment or system tests and startups.
 10. Substantial Completions authorized.
 11. A list of all visitors indicating the nature of their visit, the company they represent and the person with whom they spoke.
- F.** Color Selection Schedule: The Contractor shall submit a color selection schedule providing a listing of every product that requires color selections and categorized by exterior colors, interior colors and by room. The Contractor is responsible to coordinate meeting times with the Owner and Construction Manager (if applicable) to select colors so as not to affect the overall construction schedule or material procurement. All color samples shall be delivered to the job site trailer. **Do not submit color samples with shop drawings to the Architect.** Provide actual material color samples. **Reproduced paper or web-based email color charts are not acceptable.**
- G.** Shop Drawings: The Contractor shall submit newly prepared information drawn to scale. Indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information. The Contractor shall email electronic Shop Drawings to shopdrawings@garrisonarch.com Each separate Shop Drawing shall be submitted in a separate email as one PDF file with the “Shop Drawing Cover Page” completely filled out as the first page. The Shop Drawings shall be numbered sequentially. Include the following information:
1. Dimensions.
 2. Identification of products and materials included by sheet and detail number.
 3. Compliance with standards.
 4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurement.
 6. Sheet Size: At least 8-1/2 by 11 inches **but no larger than 30 by 42 inches.**
The Contractor shall then copy if required and forward the reviewed prints to all of the Subcontractors.
 - a. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
 7. The Contractor shall be responsible to provide the Owner and Construction Manager (if applicable) with a completed printed set of all final Shop Drawings. Promptly provide each shop drawing paper copy as approved. Do not hold or delay the paper copy from the field.
- H.** Product Data: Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.
1. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.

SECTION 01300 – SUBMITTALS

- d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
2. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
 3. Submittals: Submit a PDF via email to shopdrawings@garrisonarch.com with the completed “Shop Drawing Cover Page” as the first page of the PDF. The Architect will return the PDF via email marked with action taken. Please note that the Contractor shall be required to submit a paper copy of all finalized Shop Drawings to the Owner and Construction Manager (if applicable).
 - a. Unless noncompliance with Contract Documents is observed, the submittal serves as the final submittal.
 4. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on Cover Page forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
 - a. Do not use unmarked Product Data for construction.
- I. Samples: Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities. Provide samples to the Owner or Construction Manager’s on-site office. **Do not deliver to the Architect.**
1. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the manufacturer.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.
 2. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.
 - a. Refer to other Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar characteristics.
 - b. Refer to other Sections for Samples to be incorporated in the Work. Samples must be undamaged at time of use. On the Cover Page, indicate special requests regarding disposition of Sample submittals.
 - c. Samples not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.

SECTION 01300 – SUBMITTALS

3. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One set will be returned marked with the action taken. Maintain sets of Samples, at the Project Site, for quality comparison.
 - a. Unless noncompliance with Contract Documents is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
 4. Distribution of Samples: Distribute additional sets to subcontractors, manufacturers, and others as required for performance of the Work. Show distribution on Cover Page forms.
- J. Quality Assurance Submittals: Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.
1. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance.
 - a. Signature: Certification shall be signed by an officer authorized to sign documents on behalf of the company.
- K. Architect's Action: Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
1. Action Stamp: The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.
 2. Unless requested and paid by the submission contractor, all submittals will be returned by email. All review times start when the Architect receives the submission in his office.
 3. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with requirements of the drawings and specifications. This check is only for the review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for verifying quantities, dimensions, field conditions and coordinating all work, information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the work of all trades; and for performing work in a safe and satisfactory manner. Review does not authorize changes to contracts sum, or project completion date unless stated on separate letter or change order. Refer to the A201 Contract, including but not limited to sections 3.2, 3.3, 3.5, 3.12 and 4.2.7.

SECTION 01300 – SUBMITTALS

- M. **The Contractor shall be responsible to note in the Cover Page of the shop drawings any changes or deviations from the contract documents. This is to include but is not limited to manufacturers, electrical, plumbing, mechanical and structural requirements. The Contractor shall be responsible to distribute to all effected contractors and subcontractors all shop drawings which may affect their work.**
- N. Deviations from the construction documents must be noted by the General Contractor at the time of shop drawing submission. Failure to do so will result in the implication of Section 3.2 of the General Conditions and Paragraphs 3.2.1, 3.2.2 and 3.2.2.1.
- O. Approval of shop drawings is conditional upon the Contractor fully and completely complying with all review comments by the Owner, Architect, and Engineer. Where the Contractor fails to or is unable to fully and completely comply with every review comment, then the shop drawings are *disapproved* (whether or not they are stamped or noted as "approved" in any manner in any review comment) and must be resubmitted as within seven (7) days. Immediately upon receipt of shop drawing review comments, the contractor is responsible for carefully reviewing all comments in detail and for complying with comments. Where unable to fully satisfy any comment or where the contractor takes exception to any comment, revise and resubmit acceptable shop drawings (or, where taking exception, notify the Architect / Engineer in writing) within seven (7) days. Where the Contractor fails to comply with these requirements (including resubmitting/notifying within the seven (7) day period specified), the Contractor shall provide acceptable equipment meeting all specified requirements and all review comments (including removing unacceptable equipment [if installed] and replacing with acceptable equipment) at no cost to the Owner.
- P. **No extra claims, time or compensation will be granted under any circumstance associated with any party's failure or delay in properly submitting, transmitting, obtaining, reviewing, and/or coordinating shop drawings.**

2.1 SUBSTITUTIONS

- A. Substitution submittals shall be made **no later than 30 days after Notice to Proceed** in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products.
- B. Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc. The Architect / Engineer will consider substitutions of brand name or equal equipment equal or superior to specified equipment (meeting or exceeding all characteristics of the specified equipment).
- C. Submit shop drawings associated with substitutions complete with **comparison documentation** necessary to establish compliance with the basis of design. Submit samples of substitutions where requested. If comparison documentation and/or samples are not submitted when required, the request for substitution will be denied.

SECTION 01300 – SUBMITTALS

- D. Determination of compliance with specifications rests with the Architect/ Engineer. When a request for substitution is denied, furnish the equipment specified. The Architect's / Engineer's decisions in cases of substitutions are final and binding upon the Contractor, provide equipment accordingly

- E. Pay all costs associated with a substitution where granted. For the provisions of this section, "substitutions" includes equipment where characteristics or operation vary significantly from equipment specified (including equipment of the specified manufacturer). This includes costs incurred by any party (Contractor, Subcontractors, Owner, Architect, Engineers, etc.), costs resulting from differences of details, configuration, ratings, operation, characteristics, and dimensions between the specified and substituted equipment, costs to provide features of the specified equipment which may be manufacturer's options of the substituted equipment, and costs to remove and replace work already installed and any other remedial work as a result of substitutions. Approval of substitutions is conditional upon there being no cost change to the contract, unless specifically indicated on the shop drawings submittal and corresponding approval. The Contractor is fully responsible for coordinating with the Owner, Architect, and other trades to identify all possible cost impacts associated with any substitution before releasing equipment and before any party proceeds with work effected by the substitution.

- F. Submit bid based on the items as specified. Substitutions will be considered only after a contract has been awarded.

- G. "Or Equal" substitutions are permitted so long as they are equal to or superior to the basis of design and the Contractor takes full responsibility for all coordination and costs associated with collateral issues related to the substitution. No Substitutions will be reviewed during the bidding process. The Contractor takes full responsibility for all substitutions.

END OF SECTION 01300

Contractor's Letterhead
Contractor's Letterhead to Include Name, Physical Address,
Telephone Number and Fax Number
SHOP DRAWING COVER PAGE

Project Name
Date

Garrison Architects
Architect's Name
713 Creek Road
Bellmawr, NJ 08031

Sub Contractor's Name, Physical Address, Telephone Number and Fax Number
Supplier's Name, Physical Address, Telephone Number and Fax Number
Manufacturer's Name, Physical Address, Telephone Number and Fax Number
Specification Number and Specification Title and Section
Construction Document Plan Drawing Number and Detail Reference
Contractor's Quality Assurance Signature

Check one of the following:

- The signature above certifies that the enclosed submittal is in conformance with the construction documents and in fact is the **exact** product and manufacturer specified in the bid specifications. The signature confirms that the Contractor is responsible for dimensions and quantities that have been field verified and that the Shop Drawing will be distributed to all affected Contractors whose work may be affected by the material or equipment enclosed.
- The signature above certifies that the enclosed submittal is in conformance with the construction documents and in fact a **substitution** of the product and manufacturer specified. The Contractor shall provide all Substitutions no later than thirty (30) days from Notice to Proceed and fully comply with page 01300, paragraph 2.1. A complete comparison document must be provided. The signature confirms that the Contractor is responsible for dimensions and quantities that have been field verified and that the Shop Drawing will be distributed to all affected Contractors whose work may be affected by the material or equipment enclosed.

The Contractor assumes responsibility to fully comply with Specification Section 01300, Submittals," and note below any changes or deviations that have resulted from the proposed product substitution. The Contractor also is solely responsible to communicate these changes to all other Prime Contractor and Sub Contractors following review by the Architect / Engineer.

SHOP DRAWING NO	Date	Reviewed By	
RECEIVED FROM GC		Reviewed	
SENT TO ENGINEER		Provide as Corrected	
RETURN FROM ENG		Revise and Resubmit	
RETURN TO GC		Rejected	

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. The contractor is responsible for all corrections indicated. This check is only for the review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for verifying quantities, dimensions, field conditions and coordinating all work; including all electric for all HVAC and all other equipment; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the work of all trades; and for performing work in a safe and satisfactory manner. Review does not authorize changes to contracts sum, or project completion date. Refer to the A201 contract, including but not limited to sections 3.2, 3.3, 3.5, 3.12, and 4.2.7. The contractor shall provide all portions of the work per the manufacture's installation recommendations and instructions.

REQUEST FOR SUBSTITUTION:

Submit this form for each requested substitution. Fill in all blanks, check all boxes that apply and attach all necessary supporting data.

SUBSTITUTION NO.: _____

Specified Item: _____

Specification Section(s)/Paragraph(s): _____

Drawing Number(s): _____

Proposed Substitute: _____
(Include, as applicable, manufacturer's name and address, trade name and model number of product, and name of fabricator or supplier.)

Reason for Proposed Substitution: _____

Net Change to Contract Sum: _____ No Change; Deduct \$ _____

Change to Contract Time: _____ No Change;

The following required supporting documents are attached (Check all that apply) Items with a * are mandatory requirements for consideration.:

- *Complete Product Data
- *Itemized comparison of properties of proposed product to specified product.
- *List of other projects on which proposed has been used, with project name, design professional's name and phone number, as well as owner contact name and phone number.
- List of maintenance services and replacement materials available.
- *Statement of effect of substitution on construction schedule.
- *Description of change that will be required in other work or products if substitute product is approved.

ADDITIONAL INFORMATION:

REQUEST FOR SUBSTITUTION:

The undersigned testifies that he/she:

- Is submitting this substitution request within the limits set forth in the Contract Documents.
- Has investigated the proposed product and determined that it is equal or better than the specified product.
- Will provide the same warranty for the proposed product as for the specified product.
- Will coordinate installation and make other changes as required for the work to be complete in all respects, including: (a) redesign and (b) additional components and capacity required by other work affected by the change.
- Waives all claims for additional costs for evaluation of the substitution request, redesign if required, and reapproval by authorities having jurisdiction, if required.
- Will reimburse the Owner for additional costs for evaluation of the substitution request, redesign if required, and reapproval by authorities having jurisdiction, if required.

Contractor's Signature: _____

Typed or Printed Name: _____

Title: _____

Company: _____

Address: _____

Phone Number: _____

Owner Approval: _____ Date: _____

Construction Manager Approval (If Applicable): _____ Date: _____

Garrison Architects Approval: _____ Date: _____

Consulting Engineer Approval: _____ Date: _____

MONTHLY SAFETY & HEALTH REPORT (Required for Payment Application)

	Project/Client	Construction Company	Inspector's Name	Date		
				Yes	No	N/A
1	Safety and health protection poster on job.					
2	Emergency telephone numbers conspicuously posted.					
3	First aid kit and supplies on job.					
4	Copy of federal safety and health regulations for construction available on job.					
5	Supply of tags or locks to identify unsafe equipment.					
6	Hard hats used where there is a danger of head injury.					
7	Eye, face, ear, hand, foot & respiratory protection on job and used where necessary.					
8	Fire protection programs and fire extinguishers on job.					
9	Construction area lighted to minimum requirements.					
10	All hand and power tools in safe condition.					
11	All power tools properly guarded and grounded, hand held tools equipped with constant pressure switches.					
12	Electric tools grounded or double insulated.					
13	All extension cords (three wire) grounding type.					
14	Temporary lighting properly protected and installed.					
15	Services and fixed electrical equipment grounded and fused properly.					
16	Subpart "K" electrical complete article.					
17	Abrasive wheels and tools properly equipped and used.					
18	L.P.G. and gas storage, use and handling in accordance with appropriate standards. (i.e. capped, secured upright, cart for handling cylinders)					
19	Welding and cutting and transporting, moving and storing of gas cylinders according to standards.					
20	Employees instructed in safe welding and cutting practices.					
21	Fire protection measures taken and protective equipment used in cutting-welding.					
22	Rigging equipment inspected before each use and employees instructed for safe use.					
23	Housekeeping materials stored properly. / Good housekeeping procedures in effect.					
24	Scrap and debris removed.					
25	Egress route, corridor and passageways clean.					
26	Ladders have no broken or missing rungs or siderails (tag or lock bad ladders).					
27	Ladders used properly (1 to 4 pitch, top and bottom clear, side rails extended 36" above landing area & secured).					
28	Scaffold (rolling and free-standing) more than four times minimum base dimension, equipped with ladder.					
29	Platforms tightly planked or full width of scaffold except for necessary entrance opening.					
30	Platforms secured in place.					
31	Scaffolds provided with guardrail of 2" x 2" or equivalent, 42" high; midrail of 1" x 6" or equivalent; 4" toeboard.					
32	Scaffolds secured to the structure every 26ft. Vertically and 30 ft. horizontally					
33	Floor and roof openings and holes effectively protected with guardrails or covers.					
34	Stairways equipped with railings.					
35	Adequate supply of drinking water on job, clearly marked; paper cups.					
36	Appropriate temporary toilet facilities.					
37	Confirm a safety meeting was held this month.					
38	Perimeter guardrail protection provided around all floors 2 stories and above and roof where applicable.					
39	Adequate ventilation of work and storage spaces.					
40	Temporary heating devices inspected.					
41	Exposed rebar capped.					
42	Masonry walls braced?					
43	Trenches properly sloped for soil type.					
44	Trenches not sloped and over 5' deep are shored and braced adequately.					
45	Trenches 4' and deeper have ladder exits at least each 25' of lateral travel.					
46	Materials hoist operating rules posted in operator's station.					
47	Hoist operator's station overhead protection provided.					
48	Hoistway entrances guarded and guards painted.					
49	Onsite Cranes (Current Inspections, Swings radius marked, Clear of power lines, Outriggers and their dunnage properly set)					

SECTION 01310 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and 01 Specification Sections, apply to this Section. Refer to specification section 01315 for CPM schedule requirements.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.

1.3 SUBMITTALS

- A. Submittals Schedule: Submit an electronic copy of the schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's and Construction Manager's final release or approval.
- B. Contractor's Construction Schedule:
 - 1. The Contractor shall prepare, revise and maintain the construction schedule for all subcontractors. The Project will be scheduled and monitored using the latest version of Primavera P6, a proprietary computer software program developed by Primavera Systems, Inc., Bala Cynwyd, PA 19004 or approved equal. The Contractor shall develop the schedule (in coordination with Construction Manager and other Prime Subcontractors) in sufficient detail and clarity so that the contractors can plan, schedule and control the work properly and so that Construction Manager can readily monitor and follow the progress for all portions of the work. Construction Manager shall receive electronic copies of all schedules and updates. The Contractor shall complete a detailed schedule for the entire project that must be submitted and accepted prior to release of the second application for payment. The schedule in no way takes the place of Contractor field coordination.

SECTION 01310 - CONSTRUCTION PROGRESS DOCUMENTATION

2. This section describes the Progress Schedule requirements. Each Subcontractor shall provide all necessary information, in connection with their work, in a timely manner, to enable the Contractor to comply with these requirements. The Owner will also have specific needs for phasing of site/construction access and other issues as outlined in the Contract Documents which are to be coordinated within the schedule. No additional costs will be considered to coordinate the phasing needs and reasonable sequencing needs of the Owner. Mandatory scheduling meetings will be held monthly after the Contractor completes the detailed schedule and it is approved by the Construction Manager.
3. The Contractor shall prepare all schedules and all monthly updates based upon information furnished by the Subcontractors and based on Construction Manager's observations of the work in progress. The schedule shall be based upon each of the Subcontractors working schedule and used to plan, and organize the work (in conjunction with the Contractor's field coordination efforts), record and report actual performance and progress, and show how the Subcontractor(s) plans to complete all remaining work.
4. The completed detailed schedule shall be distributed to all Subcontractors and to Construction Manager. When the schedule is approved by the Subcontractor(s) and accepted by the Owner, it shall become one of the Contract Documents. The schedule may be revised to show changes in the Contractor's method or manner of performance; delays, changes, additions or deletions of the work, only after submission to the Construction Manager or Owner and subsequent Construction Manager or Owner's acceptance.
5. This Contract acknowledges that float belongs to the project and can be shared by the Owner and the Contractor(s).

C. Daily Construction Reports: Submit an electronic copy at weekly intervals.

D. Material Location Reports: Submit an electronic copy at weekly intervals.

E. Field Condition Reports: Submit an electronic copy at time of discovery of differing conditions.

F. Special Reports: Submit an electronic copy at time of unusual event.

1.4 QUALITY ASSURANCE

A. Pre-scheduling Conference: Conduct a conference at the Project site. Review methods and procedures related to the Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.

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10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit prior to initial application for payment. Submit concurrently with preliminary bar-chart schedule or network diagram. Include all submittals in the schedule. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
 4. Shop drawing log and schedule is to be updated and submitted at each job meeting along with job meeting report form.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

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- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 30 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.

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- h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
9. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S DETAILED CONSTRUCTION SCHEDULE

- A. 1. The Contractor with their scheduling consultant will meet with all Subcontractors and the Construction Manager within 7 days after the pre-construction meeting for the purpose of identifying all the scheduling input required for the Contractor to produce the Detailed Schedule. The Detailed Schedule will then be prepared for review within seven (7) calendar days of the meeting. All Subcontractors and Construction Manager shall review the schedule and note any corrections required as a condition of approval within seven (7) calendar days of receipt. The Contractor will prepare a finalized copy of the Detailed Schedule acknowledging their acceptance of the Schedule as their plan to construct the project. The approved, accepted Detailed Schedule will be the Contract Document used by Construction Manager to monitor the progress of the Subcontractor(s). Subsequent meetings may be required with Construction Manager and all Subcontractors. All comments on the schedule will be sent to the Contractor and Construction Manager simultaneously.

The Detailed Schedule shall comply with the various limits imposed by the scope of work and by any contractually specified intermediate milestone dates and completion dates included in the contract. The degree of detail shall be to the satisfaction of Construction Manager.

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2. Activity durations will be in work days and will have a maximum duration of twenty (20) WORKING DAYS, except in the case of non-construction activities such as procurement of materials and delivery of equipment. The project calendar shall consider and reflect planned non-work days for weekends, holidays, weather days, and planned premium work such as shift work and extended work days. Milestones will be clearly identified. Intermediate milestones will be required including but not limited to anchor bolt setting, structural steel delivery/erection, sequencing of building areas, building enclosure, overhead rough-in, phased completion of various areas, etc. The Contract Completion date shall be fixed using a constraint.
3. The Contractor will furnish Construction Manager and each Subcontractor with a copy of the initial Detailed logic diagram, computer printouts, detailed bar chart and summary bar chart. Construction Manager will also receive electronic versions of the entire schedule and any updates via email.
4. If the Contractor fails to produce an acceptable Schedule as determined by Construction Manager, Construction Manager may takeover the scheduling requirements and deduct the cost of same from the Contractor's contract sum.
5. In the event a dispute arises regarding the interpretation of the Contract CPM Scheduling requirements; Construction Manager will make the final decision as to interpretation.
6. The activities will be coded to facilitate selection, sorting and preparation of reports. Each activity will have a unique number and description. All construction activities shall be manpower, man-hour and resource loaded. The following activity coding scheme should be used:
 - Responsibility – Identify Contractor, Subcontractor, Owner, etc.
 - Phase – Phase identification from the phasing plan
 - Area – Subdivide schedule activities into logical sections including site, building areas, wings, floors, etc.
 - Masterspec, 16 division format to be assigned.
 - Procurement activities to be separate and include all major submittals, approvals and fab/del times and shall be logically tied to the appropriate installation activity.
 - Coordination and shop drawing logic shall be tied to the submittals.
7. The following computer outputs may be required by Construction Manager as part of the initial schedule submission, and each MONTHLY update thereafter: The Contractor shall provide Construction Manager with a computer disk of the schedule with each submission. All logic changes shall be noted by the consultant in a narrative report that shall also provide an executive summary of the project status.
 - Critical Activity Sort (float equals 10 day or less)
 - Early start sort
 - Eight (8) week "Look Ahead" detailed bar chart with narrative on critical path & milestones.
 - Summary bar chart
 - COM logic diagram (for baseline purposes) and a new logic diagram if logic is revised after baseline is approved.
 - Additional computer sorts as required by Construction Manager

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- Copies shall be provided for each subcontractor
 - One week filter to be used at weekly Foreman's Meeting.
8. The schedule shall show: Activity ID, Activity Description, Original Duration, Remaining Duration, Percent Complete, Early Start, Early Finish, Late Start, Late Finish and Total Float.

B. SCHEDULE UPDATE

1. Each Subcontractor is required to attend and participate in a CPM update review meeting with the Contractor and Construction Manager on a monthly basis. Attendance is mandatory and every effort will be made to have the scheduling meetings immediately following a job meeting. Each Subcontractor will supply update information including a complete and accurate report of procurement items, and work activities. If the information is not submitted, Construction Manager will provide information available at the time of the meeting. The schedule update information will include, but not be limited to:
 - a. Actual start dates
 - b. Actual completion dates
 - c. Activity percent completion with actual start date
 - d. Remaining duration of activities in progress
2. All schedule update information outlined above will be reviewed by Construction Manager at the update meeting. The Contractor shall provide Construction Manager with all reports as specified in previous paragraphs within 5 calendar days of the meeting. No logic, original duration, or other changes shall be made to the initial schedule without approval from Construction Manager.
3. The Contractor shall then prepare an eight (8) week look-ahead bar chart that will be issued to all at the next job meeting. A copy of the other scheduling documents will be available to each Subcontractor for review at the jobsite trailer.
4. Issue the draft update by the 25th of the month, final versions to be developed, reviewed and accepted by the contractors by the 5th of the next month. The updated Contractors' Construction Schedule will be reviewed at each Job Meeting. The Contractor is required to have a representative present at the Job Meeting with written authorization from the President of the Company or Corporation to review, agree upon and sign-off on any approved and agreed upon changes to the updated Contractors' Construction Schedule. Failure by any Contractor to provide timely input in the time required to update the schedule shall result in a reduction in the Prime Contractor's Contract Amount of FIVE HUNDRED (\$500.00) DOLLARS per each occurrence as liquidated damages. In addition, payment to the Contractor may result in the withholding of payments to the Contractor, and in the liability of the Contractor for liquidated damages, for failure of the Project to be completed within the designated time due to the Contractor's failure to cooperate.

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C. RECOVERY SCHEDULE

1. If the Contractor fails to achieve the planned progress, as indicated in the approved/updated Detailed Schedule and/or the Contractor's lack of progress delays attaining intermediate milestone by more than ten (10) calendar days (monthly or cumulatively); the Contractor will submit to Construction Manager for approval a proposed Recovery Schedule indicating how the Contractor will recover the time lost.

If the Contractor fails to submit a Recovery Schedule and/or fails to cooperate with the Recovery Schedule process, the Construction Manager can immediately order the Contractor to accelerate completion of the late activities by whatever means necessary, including additional personnel, equipment, overtime, double shifts, etc., without any additional costs to the Owner. The Owner/Construction Manager can withhold future progress payments until the Contractor's progress is in compliance with the contract schedule or has approved proposed adjustments to the contract milestones, extension of contract time or modification of the contract schedule.

2. Near the end of the job, Construction Manager may direct the Contractor to establish a detailed work to complete schedule that is updated on a weekly basis.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

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- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Retain Scheduling Consultant: The Contractor shall engage a consultant to provide planning, evaluation, and reporting of the construction schedule if Contractor does not employ skilled personnel with experience in CPM scheduling and reporting techniques. Qualifications of in-house or scheduling consultant shall be submitted for approval within 15 calendar days of the issuance of the Notice to Proceed.
- B. Meetings: Scheduler shall attend all meetings related to Project progress, alleged delays, and time impact.
- C. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- D. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01310

SECTION 01315 - CPM SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.
- B. The Contractor shall have the primary responsibility for the preparation and maintenance of the CPM schedule and the reporting progress of the overall Work.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 SUBMITTALS

- A. Submittal and Distribution: Within 15 calendar days of the issuance of the Notice to Proceed, the Contractor shall an electronic copy of the Preliminary Network Diagram, Preliminary Network Diagram reflecting first 60 days of work, and additional items identified in Paragraph 3.1 herein for review and acceptance by the Construction Manager and Architect.
- B. Submittal and Distribution: Within 30 calendar days of the issuance of the Notice to Proceed, the Contractor shall submit an electronic copy of the initial CPM Schedule for review and acceptance by the Construction Manager and Architect.
- C. Schedule Updating: Revise the schedule within 7 calendar days after each meeting, or other activity, where revisions have been recognized or made.
 - 1. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.
- D. Distribution: As determined during the Pre-Construction Meeting and as updated during the course of the Work.
 - 1. Distribute electronic copies of the Baseline Schedule and updates to the Construction Manager and Architect.
 - 2. Distribute the Baseline Schedule and updates in electronic PRX and PDF formats, by email, to the Construction Manager and Architect. Utilize a unique identifier for each successive update.
 - 3. Post copies of the CPM Schedule in the Project meeting rooms and temporary field offices of each Subcontractor.
- E. Regular Project Meetings: At each regular project meeting the Contractor shall issue the latest updated schedule and a two-week look ahead schedule to each of the participants.
- F. Application for Payments: The Contractor shall issue the latest updated schedule and reports concurrently with each monthly Application for Payment.

SECTION 01315 - CPM SCHEDULE

- G. Suspension of Payments: The submission and update of the CPM scheduling information is critical to the success of the project and the ability of all parties to manage the work.
 - 1. Initial Submittal: The Owner shall have the right to withhold progress payments from the Contractor until the Baseline Schedule is accepted.
 - 2. Monthly Submittals: The Owner shall have the right to withhold progress payments from the Contractor if s/he fails to update and submit monthly progress schedules and reports as specified.

1.4 DEFINITIONS

- A. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.
- B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.
- C. Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.
- D. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path.
 - 2. Predecessor activity is an activity that must occur before a given activity and controls the start or finish date of its successor(s).
 - 3. Successor activity is an activity that cannot occur until after the start of a predecessor activity.
- E. Event: An event is the starting or ending point of an activity.
- F. Float: The measure of leeway in activity performance. Accumulative float time belongs to the Owner.
 - 1. Free float: The amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float: The measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
- G. Milestone: A key or critical point in time for reference or measurement.

1.5 QUALITY ASSURANCE

- A. The Contractor's Scheduling Professional: The Contractor shall retain a scheduling consultant to provide planning, evaluating, and reporting by CPM scheduling. If the Contractor has in-house personnel certified in the CPM scheduling program that person may be used in lieu of hiring an outside consultant.

SECTION 01315 - CPM SCHEDULE

1. The consultant shall be a recognized specialist, acceptable to the Owner, Construction Manager, and Architect, who is an expert in CPM scheduling and reporting.
 2. The consultant shall have computer facilities that are capable of delivering detailed network diagrams within 48 hours of request.
- B. Standards: Comply with procedures contained in AGC's "Construction Planning & Scheduling", latest edition.

PART 2 - PRODUCTS

2.1 SCHEDULING PROGRAM

- A. Scheduling Program: The Contractor shall use P6 Primavera Project Planner (latest version available) or approved equal for network analysis that has been developed specifically to manage CPM construction schedules.

PART 3 - EXECUTION

3.1 PRELIMINARY NETWORK DIAGRAM

- A. Scheduling Work Session: Within 7 calendar days of the issuing of the Notice to Proceed the Construction Manager shall facilitate with the Contractor a Scheduling Work Session. The contractor shall provide input to arrive at an integrated CPM Schedule, which integrates construction activities, durations and sequences to facilitate completion in an orderly manner within the time frames indicated for completion, to coordinate the preparation of the Preliminary Network Diagram and the other requirements of this Section.
- B. Preliminary Network Diagram: Within 14 calendar days of the issuing of the Notice to Proceed, the Contractor shall submit a preliminary network diagram. The preliminary network diagram shall outline activities for the first sixty (60) days of construction. Include a summary listing for the remainder of the Work as part of the preliminary diagram.
1. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.
 2. Indicate completion of the Work on the date established for Substantial Completion, unless the Owner agrees otherwise.
- C. Cash Requirement Prediction: With submittal of the preliminary work diagram, include a preliminary cash requirement prediction based on indicated activities.
- D. Tabulation of Submittals: With submittal of the preliminary network diagrams, include tabulation by date of all project submittals.
- E. Distribution: Distribute the preliminary network diagram for review and approval as described in Section 01310. Distribute the preliminary network diagram to parties involved early in construction activities, including the Owner, Construction Manager, and Architect.

SECTION 01315 - CPM SCHEDULE

3.2 BASELINE CPM SCHEDULE

- A. Prepare the Baseline Construction Schedule using the network analysis diagram system known as the critical path method (CPM). Follow procedures outlined in AGC's "Construction Planning & Scheduling."
1. Proceed with preparation of the network diagram immediately following receiving the Notice to Proceed.
 2. Follow the steps necessary to complete development of the network diagram in sufficient time to submit the CPM Schedule so it can be accepted for use no later than 30 calendar days after the issuance of the Notice to Proceed.
 3. Conduct educational workshops to train and inform key project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 4. Establish procedures for monitoring and updating the CPM Schedule and for reporting progress. Coordinate procedures with foremen's meetings, progress meeting and payment request dates.
- B. CPM Schedule Preparation: Prepare a list of all activities involved in the Project. Include a list of activities required to complete the Work. Provide the best data available for generation of the network diagram and the CPM schedule.
1. Indicate the estimated time duration, sequence requirements, relationship of each activity in relation to other activities. Use "one working day" as the unit of time. Except for fabrication of materials, no single activity shall exceed 15 working days in duration.
 2. Indicate estimated times for the following activities to be performed:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - f. MEP/FP above ceiling coordination drawing.
 3. Treat each story or separate area as a separate numbered activity for principal elements of the Work.
 4. Provide detailed sub-schedules to define critical portions of the schedule.
 5. Indicate milestone dates of key portions of the work as required by the milestones in Section 01010 and the phasing schedule.
- C. Processing: Enter prepared data to produce a time-scaled logical network. Revise data, reorganize activity sequences, and reproduce as necessary to produce the CPM Schedule within the limitations of Section 01010 and the phasing schedule.
- D. Format: Display the full network on a minimum number of sheets, of sufficient width to show data clearly for the entire construction period. The critical path should be clearly marked and determinable on the diagram.
- E. Initial Issue: Prepare the initial issue of the CPM Schedule network diagram using "Early Start-Total Float" as the sorting criteria. Prepare tabulated reports to show the following:
1. The Contractor or subcontractor and work or activity.

SECTION 01315 - CPM SCHEDULE

2. Description of the activity.
3. Principal events of that activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in working days.
8. Total float.
9. Average size of workforce per activity.

F. Tabular Report: Prepare and issue 3 tabular reports, sorted as noted.

1. In first report, tabulate and sort by activity number, then by early finish date.
2. In second listing, tabulate and sort by activity number, then by late finish date.
3. In the third report, tabulate and sort by total float, then by early start date.
4. In subsequent issues of these reports, substitute actual start and finish dates for activities completed as of the data date.

G. Prepare listing for ease of comparison with payment requests; coordinate timing with progress meetings.

3.3 REVIEW AND EVALUATION OF SCHEDULE

A. Progress Meetings: The progress of the project in conjunction with the CPM Schedule will be discussed at progress meetings. Participate in joint review and evaluation of schedule with Construction Manager and Architect at each meeting.

B. Evaluate project status to determine work behind schedule and work ahead of schedule. Include:

1. Actual completion dates for work items completed during report period.
2. Actual start dates for work items started during report period.
3. Estimating remaining durations for work items in progress.
4. Estimated start dates for work items scheduled to start during month following report period.
5. Changes in duration of work items and minor logic changes.
6. Identification of current and most critical paths to required completion dates.

C. After review, revise as necessary as result of review, and resubmit within 7 calendar days.

3.4 UPDATING SCHEDULE

A. Maintain CPM Schedule to record actual start and finish dates of completed activities. The scheduling consultant will provide an update template projecting the next 2 months of work sorted by contractor on the 20th day of each month. / 2. Update activities by : a. Actual Start date / b. Actual completion date / c. Actual start w/ % complete. / d. Do not predict the remaining duration, let the program calculate.

1. Indicate progress of each activity to date of revision, with projected completion date of each activity.
2. Annotate diagrams to graphically depict current status of Work.

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3. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
 4. Indicate changes required to maintain Date of Substantial Completion.
 5. Submit reports required to support recommended changes.
- B. Submit updated schedule with each Application for Payment.
1. Work Item Report: Contain work items and dependencies as indicated on network diagram listed in order or ascending work item number.
 2. Separate listing of activities completed during reporting period.
 3. Separate listing of activities which are currently in progress indicating their remaining duration and percent complete.
 4. Separate listing of activities which are causing delay to work progress.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Narrative to include impact to the critical path and milestones (i.e. the project is x days behind/ ahead of schedule & why / the contract milestone for phase 1a is xx/xx/xx; the actual milestone date for phase 1a is xx/xx/xx and why) Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.5 RELIANCE ON SCHEDULE

- A. Expediting Activities:
1. Should any critical path activity fail to be completed within 10 calendar days after the indicated schedule date, the Contractor shall expedite completion of activity by whatever means Owner deems appropriate and necessary without additional compensation to the Contractor.
 2. Should any critical path activity performed be 28 or more calendar days behind schedule, the Owner shall have the right to perform activity or have activity performed by whatever method Owner may deem appropriate. Costs incurred by Owner in this activity shall be deducted from the Contract Price.
 3. It is expressly understood and agreed that failure by the Owner to exercise the option to expedite an activity shall not be construed as precedent for any other activities or as waiver of the Owner's rights to exercise his rights on subsequent occasions.
- B. Contract Extensions: Float time is not for exclusive benefit of either Owner or Contractor.
1. Extensions of time for Contract performance as specified in Contract shall be granted only to the extent that equitable time adjustments to affected work items exceed total float time along affected paths of accepted computer printout report in effect at that time.
 2. Slippage of work items will not be the basis for time extensions to the Contract unless, and until, such slipped work items are resolved in accordance with General and Supplementary Conditions.

END OF SECTION 01315

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control. (To be paid and hired by the Owner and coordinated by the Contractor.)
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. See all Contract Documents for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

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- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.

SECTION 01400 - QUALITY REQUIREMENTS

5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

SECTION 01400 - QUALITY REQUIREMENTS

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.
- J. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in the Contract Documents.

1.6 QUALITY CONTROL

- A. Contractor Responsibilities: Quality-control services are the Contractor's responsibility. The Owner will hire and pay for a qualified testing agency to perform these services but it is the Contractor's responsibility to coordinate and remedy any non-conforming work. Additional tests that are required resulting from any non-conforming work shall be paid for by the Contractor.
1. Contractor will furnish the Architect and Owner with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
 3. The Owner will engage a qualified Special Inspector to conduct special tests and inspections oversight in accordance with DCA Bulletin 03-5. The Owner's special inspection services will not relieve the Contractor of responsibility for certifying the work and completing the contract work in accordance with the Contract Documents.

SECTION 01400 - QUALITY REQUIREMENTS

- B. The Contractor shall provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required by authorities having jurisdiction, whether specified or not.
1. The Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Submit a certified written report, of each quality-control service to the Construction Manager, Architect, Owner, Special Inspector and authorities having jurisdiction.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: The Contractor shall provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, Owner's Special Inspector and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

SECTION 01400 - QUALITY REQUIREMENTS

7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS (BY OWNER)

- A. Special Tests and Inspections: Owner will engage a qualified **Testing Agency/Special Inspector** to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner in accordance with DCA Bulletin 03-5, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified **Testing Agency/Special Inspector** as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Review test and inspection reports completed by the Contractor's Quality Assurance and Quality Control qualified testing agency. Any irregularities or deficiencies shall be brought to the attention of the Contractor and Architect immediately.
 5. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 6. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 7. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

SECTION 01400 - QUALITY REQUIREMENTS

2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.
- D. The following items shall be tested in accordance with this section if not specifically listed in the Contract Documents as applicable to the Work:
 1. Soils and Geotechnical Engineering
 2. Foundations
 3. Concrete
 4. Masonry Reinforcing
 5. Structural Steel
 6. Cold Formed Steel Framing
 7. Roof Trusses (Wood or Steel)
 8. Sprayed-on Fire Resistant Materials

END OF SECTION 01400



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BULLETIN 03-5

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Subject: Special Inspections

Reference: N.J.A.C. 5:23-2.20(b), 3.14 and 5.3

Chapter 17 of the Building Subcode, entitled "Structural Tests and Special Inspections," is modified by N.J.A.C. 5:23-3.14. As per N.J.A.C. 5:23-2.20(b), for purposes of this chapter of the Building Subcode, a special inspection is an independent verification by a qualified person (special inspector) rendered to the code official for **Class 1 buildings, mass timber elements of Type IV-A, IV-B, and IV-C construction and a smoke control system in any building**. The special inspector is to be independent so that there is no possible conflict of interest. A summary of the special inspections provisions is included to better explain the requirements of the code.

Chapter 17 of the Building Subcode contains requirements for structural tests and special inspections. Certain special inspections required by Chapter 17 of the Building Subcode were deleted upon adoption because, in New Jersey, they are the responsibility of the construction official.

Approved Special Inspection Agencies: Agencies of this nature are regularly engaged in conducting special tests or inspections. Very often, they specialize in one aspect of the construction industry, due to the complexity of construction. This is why a special inspector who is trained in a specific area may be needed to conduct certain inspections. Special inspectors are independent of the contractor and responsible to the building owner or building owner's agent. The established and recognized special inspector, or special inspection agency proposed by the permit applicant for each special inspection, must be acceptable to the construction official.

Certified Special Inspectors: As per N.J.A.C. 5:23-5.3, special inspectors are those who will be required to perform field inspections for structural welding, structural steel and bolting, concrete placement, reinforced concrete, prestressed concrete, structural masonry, mass timber construction, soils, spray-applied fireproofing, and exterior insulation finish systems (EIFS).

Building Permits and Reports: The permit applicant is required to submit a statement of the special inspections to be performed at the time of application. The statement is to be prepared by the responsible person in charge of the work.

Structural Systems: Special inspections are required for the following as per the corresponding sections of the Building Subcode.

- *Fabrication of Structural Load-Bearing Members/Assemblies*, Section 1704.2.5: These inspections are normally handled through an in-plant, quality-control process and reports are forwarded to the local construction code office when the elements are delivered.
- *Steel Construction*, Section 1705.2: This section requires the inspection of certain aspects of the on-site erection of structural steel, cold-formed steel deck, open-web steel joists and joist girders, and cold-formed steel trusses spanning 60 feet or greater. These special inspections include welding, high-strength bolting, joint connection, and temporary restraint/bracing and permanent individual truss member restraint/bracing of cold-formed steel trusses. There are specific exceptions listed in the above-referenced code section. Additional quality control and quality assurance information is available in Chapter N of AISC 360, Specification for Structural Steel Buildings, at https://www.aisc.org/globalassets/aisc/publications/standards/a360-16-spec-and-commentary_june-2018.pdf
 - Per N.J.A.C. 5:23-5.3, certified special inspectors are authorized to carry out field inspections for steel construction using the above-referenced section and the following:
 1. Certified Structural Welding Special Inspector -- Inspections in compliance with the applicable AWS standard.
 2. Certified Structural Steel and Bolting Special Inspector -- Inspections are performed to verify compliance with the details shown on the approved construction documents such as bracing, stiffening, member locations, and proper application of joint details at each connection. Inspection of open-web steel joists and joist girders are required to be performed in accordance with Table 1705.2.3. Also, high-strength bolts are to be inspected in accordance with AISC 360 Tables N5.6-1, 6-2 and 6-3.
- *Concrete Construction*, Section 1705.3 This section addresses the placement of structural concrete. Exceptions are listed in the above-referenced section.
 - Per N.J.A.C. 5:23-5.3, certified concrete placement, reinforced concrete and prestressed concrete special inspectors are authorized to carry out field inspections for concrete construction using the above-referenced sections
- *Masonry Construction*, Section 1705.4: This section addresses the placement of structural masonry elements.
 - Per N.J.A.C. 5:23-5.3, certified structural masonry special inspectors are authorized to carry out field inspections of structural masonry and vary based on “occupancy category” as per the above-referenced section.
- *Mass timber construction*, Section 1705.5.3: This section requires inspections of mass timber elements in Types IV-A, IV-B and IV-C construction.
 - Per NJAC 5:23-5.3, certified special inspectors are authorized to carry out continuous and periodic inspections of mass timber construction in accordance with Table 1705.5.3

- *Soils*, Section 1705.6: This section addresses existing site soil conditions, fill placement and load-bearing requirements. A soils report, required as per Section 1803 of the Building Subcode, is used to determine compliance with the placement of load-bearing fill.
→ Per NJAC 5:23-5.3, certified special inspectors are authorized to carry out continuous and periodic inspections of soils in accordance with Table 1705.6.
- *Driven deep (Pile) Foundations*, Sections 1705.7, 1705.8 and 1705.9: These sections require special inspections during the installation of driven, cast-in-place and helical pile foundations. There are no current certification requirements for driven deep foundations special inspectors, however, a licensed design professional is required.

Special Inspections for Seismic Resistance: Special inspections are required for seismic force-resisting systems; designated seismic systems; and architectural, mechanical, and electrical components in Seismic Design Category D, E and F buildings¹. The following components are special inspections related to seismic resistance found in Section 1705.13 of the Building Subcode.

- * Structural Steel
- * Structural Wood
- * Cold-Formed Steel-Light Frame Construction
- * Designated seismic systems
- * Architectural Components
- * Plumbing, Mechanical and Electrical Components
- * Seismic Isolation Systems
- * Storage Racks
- * Cold-Formed Steel Special Bolted Moment Frames

Structural Testing for Seismic Resistance: Prior to construction, all materials and assemblies used for isolation damping systems in Seismic Design Category D, E and F buildings¹ are required to be tested and verified as per Section 1705.14 for seismically isolated structures.

Finishes:

- *Sprayed, Fire-Resistant Materials*, Section 1705.15: Special inspections are required for sprayed, fire-resistant materials applied to floor, roof and wall assemblies and structural members. Details include condition of the substrates, thickness of application, density in pounds per cubic foot, bond strength adhesion/cohesion and condition of the finished application.
→ Per N.J.A.C. 5:23-5.3, certified special inspectors are authorized to carry out field inspections for sprayed, fire-resistant materials using the above-referenced section and are to be based on the fire-resistance design as designated in the approved construction documents.
- *Mastic and Intumescent Fire-Resistant Coatings*, Section 1705.16: Special inspections are required for mastic and intumescent fire-resistant coatings applied to structural elements and decks and are to be based on the fire-resistance design as designated in the approved construction documents.

- *Exterior Insulation and Finish Systems (EIFS)*, Section 1705.17: Special inspections are required for all EIFS applications. *Exceptions*: installations over a water-resistive barrier with a means of draining moisture to the exterior, or when installed over masonry or concrete
→ Per N.J.A.C. 5:23-5.3, certified special inspectors are authorized to carry out field inspections for all EIFS using the above-referenced section.
- *Fire-resistant penetrations and joints*, Section 1705.18: Special inspections are required for through-penetrations, membrane penetration firestops, fire-resistant joint systems and perimeter fire containment systems in high-rise buildings, in buildings assigned to Risk Category III or IV, or in fire areas containing Group R occupancies with an occupant load greater than 250.

Special Inspection for Smoke Control: A special inspector, qualified as per Section 1705.19.2 of the Building Subcode, is required to test smoke control systems. The inspector inspects for leakage testing, recording of device location, pressure difference testing, flow measurements, and detection and control verification.

Special Cases: N.J.A.C. 5:23-2.19(a) authorizes the building subcode official to require special inspections for proposed work that is unusual in nature. Some examples include alternative construction materials and systems, unusual design applications of materials, and materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained or referenced in the Building Subcode.

Examples:

- Any building that meets N.J.A.C. 5:23-4.3A(d)3, Class 1 building → apply applicable special inspections.
- Any Class building of Type IV-A, IV-B, and IV-C construction → apply mass timber special inspection.
- Any Class building of any construction type with a smoke control system → apply smoke control special inspection.

¹ *Seismic Design Categories are determined in accordance with Section 1613 of the building subcode. In order to utilize the equations, figures and tables of this section, one will need the Site Class definition per the ASCE 7, as adopted at Chapter 35 of the building subcode, and the Risk Category per Table 1604.5 of the building subcode.*

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.1 GENERAL

- A. Summary: This Section specifies construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department and rescue squad rules. Local traffic requirement.
 - 5. Environmental protection regulations.
 - 6. New Jersey Department of Education.
 - 7. ADA requirements.
 - 8. OSHA.

The Contractor may be required to pay for and obtain building permits, temporary construction trailer permits, etc. as required by the local construction code office.

- C. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
- E. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. Submit reports and tests, inspections, meter readings, and procedures performed on temporary utilities. At the earliest time, change over from use of temporary service to use of permanent service.

1.2 PRODUCTS

- A. Materials: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
 - 1. Lumber and Plywood: Comply with Division 6 Section "Rough Carpentry." Provide UL-labeled, fire-treated lumber and plywood for temporary offices and sheds. Provide exterior, Grade B-B high density concrete form overlay plywood for signs. Provide 5/8" (16 mm) thick exterior plywood for other uses.
 - 2. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.
 - 3. Paint: Comply with requirements of Division 9 Section "Painting."

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- a. For exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
 - b. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
 - c. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.
4. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
 5. Water: Provide potable water approved by local health authorities.
 6. Open-Mesh Fencing: Provide 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.
- B. Equipment: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
1. Water Hoses: Provide 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
 2. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
 3. Electrical Power Cords: Grounded extension cords. Use hard-service cords where exposed to abrasion and traffic.
 4. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
 5. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
 6. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - a. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.3 EXECUTION

- A. Installation, General: Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. **Provide each facility ready for use when needed to avoid delay.** Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
 2. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate safely and efficiently. Relocate as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.
- B. Temporary Utility Installation: The **Contractor** shall engage the local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 4. Use Charges: **Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. The Contractor shall pay for all temporary or permanent utilities until Substantial Completion.** If the Owner's utilities are used, the Contractor shall be responsible for metering and reimbursing the Owner for usage. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
 5. Temporary Water Service: (Installed and paid of usage by Contractor). Install temporary water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. If temporary water is connected to the Owner's line, the Contractor shall compensate to the Owner for water usage.
 6. Temporary Electric Power Service: (installed and paid of usage by Contractor). Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - a. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage.
 - b. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.
 - c. If temporary power/lighting connect to the Owner's panel, the Contractor shall compensate the Owner for the electrical usage.
 - d. Under no circumstances will the temporary electric be turned off due to labor disputes, work hours, etc.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- C. Temporary Heat: (installed and paid of usage by Contractor). Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Temporary heat must be on to dry out masonry walls at least two weeks prior to painting. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy. All temporary heat must be on by November 11th. Anywhere in the building, the minimum temperature is to be 60 degrees Fahrenheit.
1. Heating Facilities: **The use of the building's permanent HVAC systems is prohibited and shall not be used. The building must be 100% white glove clean and dust free prior to starting the HVAC system.** Provide vented, self-contained, LP-gas or fuel-oil heaters with individual space thermostatic control. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
 2. Safety Requirements: provide a fire extinguisher for each heating unit,. Comply with all local, governmental and manufacturer's requirements for safe operation.
- D. Temporary Telephones: The Contractor shall be responsible for their own telephone service.
- E. Sanitary Facilities: (installed and paid for maintenance by Contractor). Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
1. Toilets: Install self-contained, single occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass fiber reinforced polyester steel or similar nonabsorbent material. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted. The construction team is not permitted to use the school facilities at any time. Provide separate facilities for male and female personnel.
- F. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
1. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- G. Support Facilities Installation: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. Owner's Field Office: The Contractor shall provide a heated and air-conditioned, insulated, weather tight 10' x 30' temporary office trailer for the project site. The Contractor may not store materials for the project within this trailer. The Owner's field office trailer at the project site shall include a separate office for the Owner's Representative and meeting room with seating for a minimum twelve(12) people. Provide this office trailer on a foundation adequate for normal loading. Provide units with lockable entrances, operable windows, and serviceable finishes. Provide a first aid kit. Bathroom facilities in trailer to include: Water closet (a chemical toilet/tank with cleaning minimum once per week), toilet tissue dispenser, paper towel/ hand towel dispenser, sink with cold and hot water capabilities/ liquid soap dispenser The Owner's field office trailer shall be fully furnished and equipped with all new furniture and equipment to be turned over to the Owner as the completion of the project by the Contractor as follows:
 - a. The Owner's Representative Office shall have a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase. Equip with a water cooler, and scanner/copy equipment. Provide high speed internet service. All expenses for installation and operation of the above facilities should be paid by the Contractor. The Contractor shall hire a professional cleaning service to clean the trailer at least once a week. No work men are allowed to use the trailer for coffee breaks or lunch. This office trailer must be fully furnished and operable within three weeks from award of the contract. Payment will be withheld until the trailer is fully operational.
2. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.
3. Storage and Fabrication Sheds: (Contractors): Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.
4. Dewatering Facilities and Drains: (by Contractor). For temporary drainage and dewatering facilities and operations, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
5. Temporary Enclosures: (by Contractor). Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - a. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
 - b. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
6. Temporary Lifts and Hoists: The Contractor shall provide facilities for hoisting their own materials.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

7. Project Signs: The Contractor shall furnish and install 4' x 8' project identification and other signs where indicated to inform the public and persons seeking entrance to the Project. Support on framing of preservative treated wood or steel. Do not permit installation of unauthorized signs. Engage an experienced sign painter to apply graphics. Comply with details indicated. The content of sign shall be similar to the cover sheet of the drawings plus all prime subcontractors names.
 8. Temporary Exterior Lighting: (Contractor) Install exterior yard and sign lights so signs are visible when Work is being performed.
 9. Collection and Disposal of Waste: (Contractor). The Contractor shall collect their own waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.
 - a. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C).
 10. Pest Control: (by Contractor). Retain an exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- H. Access to the building pad (by the Contractor): The Contractor shall provide and maintain through the construction project a stoned access roadway for vehicles and deliveries to the building pad and as required around the building pad. This temporary access roadway shall be installed at the beginning of the project and be removed at the end of the project with the area affected fully restored.
- I. Security and protection facilities installation: (by Contractor). Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.
1. Temporary Fire Protection: (by Contractor). Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
 - a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - b. Store combustible materials in containers in fire-safe locations.
 - c. Prohibit smoking in hazardous fire-exposure areas.
 - d. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

2. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
 3. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
 4. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
 - a. Provide open-mesh, chain link fencing with posts set in a compacted mixture of gravel and earth.
 - b. Provide plywood fence, 8 feet (2.5 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, and preservative-treated wood posts spaced not more than 8 feet (2.5 m) apart.
 - c. The Contractor shall provide a temporary construction fence whether shown on the contract documents or not as required to separate the area or areas under construction from the Owner's area or areas used by the public. The temporary fencing shall be approved by the Owner prior to installation.
 5. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
 6. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.
- J. Operation: The Contractor shall be responsible to enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- K. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- L. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- M. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.
 3. Prior to Final Completion, restore site damages resulting from construction activities. This includes, but is not limited to: removal of temporary fencing; restoring site disturbance resulting from contractor parking, trailers, sanitary facilities, dumpsters, construction equipment, etc. Site restoration to include fine grading with approved topsoil and reseeding with approved seed.

END OF SECTION 01500

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous construction waste.
 - 2. Recycling nonhazardous construction waste.
 - 3. Disposing of nonhazardous construction waste.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE GOALS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work.
- B. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following materials:
 - 1. Construction Waste:
 - a. Site-clearing waste.
 - b. Masonry and CMU.
 - c. Lumber.

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- d. Wood sheet materials.
- e. Wood trim.
- f. Metals.
- g. Roofing.
- h. Insulation.
- i. Carpet.
- j. Gypsum board.
- k. Piping.
- l. Electrical conduit.
- m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

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1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Forms: Prepare waste management plan on forms included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site.
 - 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4-inch (100-mm) size.
- B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
 - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- G. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

- H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- I. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
- C. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01524

SECTION 01600 - MATERIALS AND EQUIPMENT

1.1 GENERAL

- A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.
1. "Named Products" are items identified by the manufacturer's product name, including make or model number or designation, shown or listed in the manufacturer's published product literature.
- B. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
- D. Product List: Products required are included in all sections of these specifications. Provide the manufacturer's name and proprietary product names for each item. Coordinate product list with the Contractor's Construction Schedule and Submittal Schedule.
1. Form: Prepare product list with information on each item tabulated under the following column headings:
 - a. Related Specification Section number.
 - b. Generic name used in Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 2. Within 30 days after date of commencement of the Work, submit 3 copies of the product list. Provide a written explanation for omissions of data and variations from Contract requirements.
 3. The Architect will respond within 2 weeks of receipt of the list. No response within this period constitutes no objection to listed manufacturers or products but does not waive the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable products.
- E. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
1. When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.
- F. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

SECTION 01600 - MATERIALS AND EQUIPMENT

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
- G. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
1. Schedule delivery as early as possible. Coordinate with installation to assure safety for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger the supporting construction.
 5. Store products subject to damage by the elements aboveground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.2 PRODUCTS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Procedures governing product selection include the following:

SECTION 01600 - MATERIALS AND EQUIPMENT

- a. Proprietary Specification Requirements: Where products are specified by name, accompanied by the term "or equal" or "or approved equal" comply with specified product standards and data to obtain approval for use of an unnamed product. Where products are specified by name not accompanied by the term "or equal" or "or approved equal" comply with specified product standards and data to obtain approval for use of an unnamed product. See Specification Section 01300, "Submittals," page 01300-6 and 01300-7, Paragraph 2.1 for specific Substitution requirements.
2. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning submissions to obtain approval for use of an unnamed product.
3. Descriptive Specification Requirements: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements.
4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application. Manufacturer's recommendations may be contained in product literature or by the manufacturer's certification of performance.
5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
6. Visual Matching: Where Specifications require matching a Sample or existing building items, the Architect's decision on whether a product matches will be final.
7. Visual Selection: Where requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product that complies with other requirements. The Architect / Owner will select the color, pattern, and texture from the product line selected.

1.3 EXECUTION

- A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01650 – GENERAL: FACILITY START-UP/COMMISSIONING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The purpose of this section is to specify responsibilities and participation in the start-up and commissioning process. The responsibility of the electrical, general and plumbing contractors for this process is to provide the necessary systems and equipment as shown in the contract documents, which enable the mechanical equipment to operate in accordance with the contract documents. (ex. connect electrical power, adequate support for the mechanical equipment, gas supply etc.). It is the contractor's responsibility to demonstrate, through the commissioning process, that equipment is operating in accordance with the contract documents. The attached "Commissioning Responsibility Matrix" lists responsibilities for various parties involved in Commissioning. Parties having primary responsibility are identified with a "1"; parties having secondary (or support) responsibilities are identified with a "2".

1.03 SUBMITTALS

A. **The Contractor shall:**

1. Provide all submittals as required in Division 15 specification sections.
2. Provide (as submittals) manufacturers startup requirements for all mechanical equipment.
3. Review the commissioning plan and provide comments to the Commissioning Agent. The Commissioning Agent has primary responsibility for the Commissioning Plan.
4. Develop schedules for all testing based upon the commissioning plan. This schedule must be integrated into the master construction activity schedule.
5. Provide and Submit completed pre-functional test forms and any manufacturer's startup forms to the Commissioning Agent for review. Document manufacturer's startups/pre-functional tests for all mechanical equipment.
6. Submit Operations and Maintenance Manuals in accordance with Division 15.
7. Provide syllabus for training and provide training, in accordance with requirements of Division 15.
8. Cooperate with the Commissioning Agent and TAB agent throughout Cx and TAB processes.

B. The Commissioning Agent shall:

1. Prepare an overall commissioning plan, including all functional tests to be performed for equipment and systems.
2. Review pre-functional checklists and manufacturers startup reports.
3. Develop functional test procedures for all equipment and systems. Procedures shall include forms to be completed by the Mechanical Contractor in order to document functional performance tests.
4. Review functional performance test records.
5. Provide final commissioning report, incorporating functional performance test records, inspection reports, etc.
6. Review the Test and Balance Report and provide any comments to the Engineer with copy to the Construction Manager.
8. Review Operations and Maintenance Manuals submitted by Mechanical Contractor.
9. Review Training syllabus prepared by Mechanical Contractor.

SECTION 01650 – GENERAL: FACILITY START-UP/COMMISSIONING OF MECHANICAL SYSTEMS

C. The Engineer shall:

1. Review the Commissioning Plan developed by the Commissioning.
2. Review all submittals.
3. Review manufacturers' startup procedures.
4. Review functional test records.
5. Review the Test and Balance Report.
6. Review Operations and Maintenance Manuals.
7. Provide Base Ventilation Rate (CFM) for VAV A/C Units.

PART 2 – PRODUCTS

Not applicable.

PART 3 – EXECUTION

A. The mechanical contractor shall:

1. Coordinate all commissioning activities with their work.
2. Attend Commissioning Meetings.
3. Fill out pre-functional checklists for all mechanical equipment. If required per specification perform manufacturers startup procedures for that equipment in addition to the pre-functional checklists.
4. Perform functional performance testing of all mechanical equipment and systems, in accordance with procedures developed by the Commissioning Agent. Commissioning agent will witness and document.
5. In the event that a functional performance test fails, the cause of failure shall be determined and rectified as soon as possible, and then retested. If more than two functional performance tests, involving witnessing by the Engineer and/ or Commissioning Agent of the same system(s) or equipment are required, the contractor shall reimburse all associated costs for the extraordinary participation of the architect and owner's staff, as required by the particular test being performed;
6. Make all corrections and adjustments to equipment and systems in order to achieve TAB performance in accordance with the Contract Documents.
7. Oversee and/or provide training for the systems specified in division 15.

B. The duties of the commissioning agent are:

1. Oversee all commissioning activities, and facilitate communication between team members (Mechanical Contractor, Engineer, Construction Manager, and Owner) regarding commissioning activities. Commissioning Agent shall advise the Construction Manager of any concerns regarding work practices or installation of equipment which may negatively affect commissioning, testing and balancing, and work actively with the Owner's team to resolve issues regarding commissioning testing and balancing.

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2. Set up, conduct and document a pre-commissioning meeting with the Owner, Mechanical Contractor, Construction Manager and Engineer. Pre-commissioning meeting will involve a review of the Commissioning Plan and pre-functional procedures.
3. Set up, conduct and document commissioning meetings with the Owner, Mechanical Contractor, and Construction Manager. Meetings shall be conducted during the period(s) of time when functional performance testing is underway, and shall be conducted on a bi-weekly basis.
4. Perform bi-weekly site visits to witness and document on-going mechanical work on site (once Mechanical Contractor has mobilized). Consultant shall provide written report for each site visit, listing any deficiencies in work and corrective action required.
5. Witness manufacturer's startup (pre-commissioning start up) of equipment. For RTU's, Boilers, Chillers, VFD drives and Pumps, 100% witnessing is required. For all other equipment, 20% of manufacturers' startups for each type of equipment shall be witnessed.
6. Witness functional performance tests for equipment and systems. Assist Mechanical Contractor and Engineers in resolving problems encountered during functional performance testing.
7. Review the Test and Balance report and provide any comments to the Engineer with copy to the Construction Manager.

Team Member: Owner CM A/E CxA TAB MC/GC Notes

Activity:	Owner	CM	A/E	CxA	TAB	MC/GC	Notes
oversee commissioning		2		1		2	
prepare commissioning plan				1			
review commissioning plan		1				2	
prepare construction schedule						1	
coordinate commissioning activities with schedule		1		2		1	MC revises schedule based on Cx Plan
set up commissioning meetings				1			
attend commissioning meetings	1	1		1	2	1	TAB attends Cx meetings when necessary
document commissioning meetings				1			
provide equipment submittals						1	
review submittals		2	1	2			
provide ATC submittal						1	
review ATC submittal		2	1	2			
witness ongoing installation of Work		1				1	
periodic inspection of Work		1	2	1		1	
provide periodic installation inspection reports		1	2	1			deficiencies must be noted
provide manufacturers startup/prefunctional procedures						1	
review manufacturers startup/prefunctional procedures		2	2	1			
perform and document manufacturers startup/prefunctional procedures						1	provide completed report to all
witness manufacturers startup/prefunctional procedures		1		1		1	spot witnessing may be sufficient
review equipment startup/prefunctional test reports		2		1			
prepare functional test forms				1			
perform functional tests		2		2		1	
witness and document functional tests		2		1		2	
review functional test reports		2	2	1			
prepare TAB plan						1	TAB portion of the work is in the MC/GC's Scope of Work
review TAB plan		2	2	1		1	
perform and witness TAB		2				1	
document TAB						1	
review TAB report	2	2	1	2		1	
provide training syllabus - coordinate Owner training		2	2			1	
provide (and document) training						1	video tape training where specified
attend training	1					1	
prepare final commissioning report				1			
provide O&M's and as-builts						1	
review O&M's and as-builts							
	1	1	2	1			

Refer to Key on second page for explanation of team members and responsibilities

SECTION 01700 - CONTRACT CLOSEOUT

1.1 GENERAL

- A. Please refer to the “**PROJECT CLOSEOUT CHECKLIST**” at the end of this section for the summary of materials required to complete the contract obligation. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.
- B. Substantial Completion: The Contractor shall request the Owner, Construction Manager (if applicable) and Architect to inspect the job and perform a punch list to certify Substantial Completion. Refer to Specification Section AIA 201 General Conditions of the Contract for Construction, paragraph 9.8, for the definition of Substantial Completion. Before requesting inspection for certification of Substantial Completion, the Contractor shall complete the following:
1. “PUNCH LIST”: Before the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list (PUNCH LIST) of items to be completed or corrected. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.
 2. The Contractor shall perform a Quality Control / Quality Assurance QC/QA Punchlist of all work prior to requesting Substantial Completion and a punch list from the Owners Team. The Contractor’s Project Manger shall take the lead and conduct an onsite review with the Contractor’s superintendent and representation from every major sub prime contractor. Notification of this onsite walk thru shall be provided in writing to all members of the Owners Team who may or may not choose to attend. The Contractor’s Project Manager shall record and distribute this QC/QA Punchlist in a matrix that provides an additional column for the Contractor to document the completion of the work and the date. After successful completion of the Contractor’s QC/QA Punchlist and all work, the Contractor shall request the Construction Manager and Architect perform a Punchlist. Substantial Completion shall be requested in accordance with paragraph 9.8.1 of Specification Section AIA 201 General Conditions of the Contract for Construction,
 3. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.
 - a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
 4. Advise the Owner of pending insurance changeover requirements.
 5. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 6. Submit record drawings, maintenance manuals, and, if specified elsewhere, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 7. Deliver tools, spare parts, extra stock, and similar items.

SECTION 01700 - CONTRACT CLOSEOUT

8. Changeover locks and transmit keys to the Owner.
 9. Changeover temporary construction utilities to Owner including electric, water, gas, sewer, storm, fire protection, etc.
 10. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
 11. Complete final cleanup requirements, including touchup painting.
 12. Touch up and repair and restore marred, exposed finishes.
 13. Submit Certificate of Occupancy/Approval
 12. Remove temporary covered walkway, fence, and complete all curbs, paving, concrete walks, etc.
- C. Inspection Procedures: On receipt of a request for inspection, the Construction Manager will proceed or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
1. The Construction Manager (if applicable) or Architect will repeat inspection when requested and assured that the Work is substantially complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance.
- D. Final Acceptance: Please refer to the “**FINAL PAYMENT CHECKLIST**” at the end of this section for the summary of materials required to complete the contract obligation. All “**PROJECT CLOSEOUT CHECKLIST**” items shall be completed before requesting Final Acceptance or Final Payment.
- E. Reinspection Procedure: The Construction Manager will reinspect the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner, Construction Manager and Architect.
1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required.
 2. If necessary, one (1) reinspection will be provided free of cost to the Contractor. If the Contractor fails to complete the work and a third or subsequent inspections are required, then the Contractor agrees to pay the Construction Manager and/or Architect for all extra inspections.
- F. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Construction Manager’s (if applicable) / Architect's reference.

SECTION 01700 - CONTRACT CLOSEOUT

- G. Record Drawings: Maintain a set of Original Signed and Sealed Prints of Contract Documents and Shop Drawings in the job trailer accessible to the Local Authority having jurisdiction, Owner, Construction Manager and/or Architect. The drawings shall be updated daily. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.
1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.
 2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.
- H. Maintenance Manuals: Organize operation and maintenance documents into two (2) sets of manageable size. Bind in individual, heavy-duty, 2-inch (51-mm), 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include all the information required in the **“PROJECT CLOSEOUT CHECKLIST.” Project Closeout Checklist Documents including these Maintenance Manuals shall be delivered to the OWNER OR CONSTRUCTION MANAGER (if applicable).**
- I. Record RFIs (Request for Information): The Contractor shall maintain a complete record of all RFIs in the job trailer accessible to the Local Authority having jurisdiction, Owner, Construction Manager and/or Architect. The RFI Logbook shall be updated daily.

1.2 PRODUCTS

1.3 EXECUTION

- A. Operation and Maintenance Instructions: The Contractor shall coordinate and arrange for each Installer/Manufacturer to provide instruction in proper operation and maintenance to the Owner’s Staff. Refer to the applicable Specification Section for the requirements of Owner Instruction. The Owner, Construction Manager (if applicable), and Architect shall be notified of this instructional meeting 3 days in advance. The instructional meeting shall include a detailed review, but not be limited to, the following items:
1. Maintenance manuals.
 2. Spare parts, tools, and materials.
 3. Lubricants and fuels.
 4. Identification systems.
 5. Control sequences.
 6. Hazards.
 7. Warranties and bonds.
 8. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following:
1. Startup and shutdown.
 2. Emergency operations and safety procedures.
 3. Noise and vibration adjustments.

SECTION 01700 - CONTRACT CLOSEOUT

- C. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
 - 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. The Contractor shall clean vinyl composite tile, ceramic tile, terrazzo, sealed concrete, etc. "mop clean." Strip all VCT flooring and apply three coats of wax. Vacuum carpeted surfaces.
 - 4. Wipe surfaces of mechanical and electrical equipment to a dust free condition. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
 - 5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.
- D. Removal of Protection: Remove temporary protection and facilities.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.
- F. Contractor shall provide an as-built survey of all installed utilities, as well as existing utility features to remain that are uncovered during construction, including locations and elevations. The as-built survey shall be provided as a hard copy plan sheet and in electronic format (AutoCAD or similar file type) on a CD, flash drive or similar acceptable electronic media.

END OF SECTION 01700

PROJECT CLOSEOUT CHECKLIST

CONTRACTOR MUST COMPLETE AND SUBMIT (1) ONE SET OF AS-BUILT DOCUMENTS, TWO (2) SETS OF CLOSEOUT BINDERS AND ONE (1) TRAINING VIDEO TO THE OWNER OR CONSTRUCTION MANAGER WITH AN ELECTRONIC COPY OF THE AS-BUILT DOCUMENTS EMAILED TO THE OWNER, CONSTRUCTION MANAGER (if applicable) AND ARCHITECT

Complete,
Incomplete or
N/A

AS-BUILT DOCUMENTS - ONE SET per Building Location

* All As-Built Documents must be clearly labeled "AS-BUILT" with a date and Contractor's signature. If the Owner has contracted with a Construction Manager, the Contractor must review all As-Built notations with the C.M. prior to delivering to Owner.

1. Record "as-built" contract drawings. (1 paper copy & PDF files emailed to the Owner, Construction Manager (if applicable) and Architect. In lieu of emailing the file, the Contractor can provide a flash drive of the PDF.)
2. Record "as built" shop drawings. (1 paper copy & PDF files emailed to the Owner, Construction Manager (if applicable) and Architect. In lieu of emailing the file, the Contractor can provide a flash drive of the PDF.)

CLOSE-OUT BINDERS - TWO SETS per Building Location

* All items shall be in a 3-ring loose leaf binder, clearly labeled (minimum: building, discipline/trade & year) on Front and Side Spine. Include a helpful table of contents and index tabs. Also provide this information in a PDF File emailed to the Owner and Construction Manager (if applicable.)

1. Maintenance manuals/operating and maintenance instruction. See Specification Section 01700.
2. Warranties and bond manual. See Specification Section 01740.
 - * **WARRANTY CLARIFICATION:** Contractor shall separately identify any warranty that requires execution by Owner or otherwise. "Copies" of warranties should be included in the close-out "binder". "Original" warranties requiring execution should be sent under a separate cover. The separate cover should clearly identify the action required to execute the warranty.
3. List of contact persons for the Contractor and all sub-contractors. Include contract responsibility, name of company, name of person, street address, mailing address (if different), telephone and email address.
4. Copy of final inspection reports / permit closeout document.
5. Attic Stock, Special tools, spare parts, extra stock materials, etc. shall be turned over to Owner. Include a list in the closeout binder.

OWNER TRAINING VIDEO – ONE COPY per Building Location
FINAL PAYMENT CHECKLIST

Complete,
Incomplete or
N/A

*** DO NOT submit Final Payment until all items can be included.**

CONTRACTOR MUST COMPLETE AND SUBMIT (3) THREE SETS OF
COLLATED, NOTARIZED ORIGINALS & (1) ONE COMPLETE
ELECTRONIC COPY VIA EMAIL TO THE ARCHITECT WITH FINAL
PAYMENT APPLICATION:

1. An Index of Documents Included on the Contractor's Letterhead.
2. Owner Payment Voucher (if required by Owner).
3. AIA Payment Application.
4. AIA Document G706 – 1994 Contractor's Affidavit of Payment of Debts and Claims
5. AIA Document G706A – 1994 Contractor's Affidavit of Release of Liens
6. Contractor's Certification of Completion
7. AIA Document G707 – 1994 Consent of Surety to Final Payment
8. Maintenance Bond for 100% of the Project Cost for a warranty period of two (2) years from the Date of Final Acceptance.
9. The Contractor shall not use any product containing asbestos and all plumbing shall be lead free. The Contractor shall provide a notarized letter stating: "No asbestos containing materials were provided on the project and the plumbing is lead free."
10. Contractor shall furnish a letter agreeing to provide complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for 2 years from date of substantial completion as determined by architect. The letter shall also affirm that the Contractor will provide scheduled maintenance service quarterly (3-month interval) as the maximum time period between scheduled service.
11. Certificate of Occupancy or Acceptance by the Local Construction Official.
12. Provide a Fire Alarm System NFPA Record of Inspection and Testing Certification Form.

ADDITIONAL REQUIREMENTS TO BE SATISFIED PRIOR TO
CERTIFICATION OF FINAL PAYMENT:

1. Project Closeout Documents (submit separately as indicated on the Project Closeout Checklist).

SECTION 01740 - WARRANTIES AND BONDS

1.1 GENERAL

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
 - 2. Requirements for Warranties and Bonds for products and installations that are specified are included in the individual sections of these specifications.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.
- G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

SECTION 01740 - WARRANTIES AND BONDS

- H. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

- I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

- J. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 01770 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1. Related Documents
 - A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.2 Summary
 - A. This Section requires the selective removal, salvage to Owner and/or subsequent offsite disposal of the following:
 1. Removal of HVAC equipment and/or relocation of pipes, conduits, ducts and/or other mechanical and electrical work as required and specified in other Divisions.
 2. Cutting nonstructural concrete floors and masonry walls for piping, ducts and/or conduits as required to perform the work specified in other Divisions. Refer to the respective mechanical and electrical specification sections for additional demolition requirements.
- 1.3 Submittals
 - A. General: Submit the following in accordance with General Conditions of the Contract and Division 1 Specification Section: SUBMITTALS.
 - B. Schedule indicating proposed sequence of operations for selective demolition work to the Construction Manager for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
 1. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 2. Coordinate with Owner's continuing occupancy of portions of existing building and site.
 - C. Photographs of existing conditions of structures, HVAC equipment and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.
- 1.4 Job Conditions
 - A. Condition of Structures: Owner assumes no responsibility for actual condition of structures to be demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.
 - B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

SECTION 01770 - SELECTIVE DEMOLITION

1. Storage or sale of removed items will not be permitted on site.
- C. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
1. Erect temporary covered passageways as required by authorities having jurisdiction.
 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.
 3. Protect from damage existing finish work that is to remain in place that becomes exposed during selective demolition operations.
 4. Protect floors with suitable coverings to protect from demolition activities.
 5. Construct temporary insulated dust-proof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust-proof doors and security locks.
 6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 7. Remove protections at completion of work.
 8. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
- D. Damages: Promptly repair damages caused to adjacent facilities by selective demolition operations.
- E. Traffic: Conduct selective demolition operations and debris removal of to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close, block or otherwise obstruct streets, walks, or other occupied or used facilities without permission from the Owner or the authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- F. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
- G. Utility Services: Maintain existing utilities indicated to stay in service and protect against damage during selective demolition operations.
1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities. **WATER SERVICE MUST REMAIN UNINTERRUPTED TO ALL PORTIONS OF THE BUILDING(S) AND SITE.**

SECTION 01770 - SELECTIVE DEMOLITION

2. Maintain fire protection services during selective demolition operations.
- H. Environmental Controls: Use water sprinkling, temporary enclosures and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may cause damage or create hazardous or objectionable conditions such as ice, flooding and pollution.
- I. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advanced notice to Owner of demolition activities that will affect Owner's normal operations.

PART 2 - ITEMS TO BE SALVAGED AND RETAINED AS PROPERTY OF THE OWNER

- A. Items to be relocated/reset or turned over to the Owner, shall be safely stored by the Contractor until relocation or turning over to the Owner is possible. Owner shall have first right of refusal for RTUs prior to removal from site.

PART 3 – EXECUTION

3.1 Preparation

- A. General: Provide interior and exterior shoring, bracing or support to prevent movement, settlement or collapse of areas to be demolished and adjacent facilities to remain.
1. Cease operations and notify the Construction Manager immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
 2. Cover and protect furniture, equipment and fixtures from spoilage or damage when demolition work is performed in areas where such items have not been removed.
 3. Erect and maintain dust-proof partition and closures as required to prevent spread of dust or fumes to occupied portions of the building.
 - a. Provide weatherproof closures for exterior openings resulting from demolition work.
 - b. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4-inch studs, 5/8-inch drywall (joints taped) on occupied side, 1/2-inch fire retardant plywood on demolition side. Fill partition cavity with sound deadening insulation.
 4. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

SECTION 01770 - SELECTIVE DEMOLITION

- a. Provide bypass connections as necessary to maintain continuity of service to occupied area of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 Demolition

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 1. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
 2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
- B. If unanticipated mechanical, electrical or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
- C. Vermin Control: Employ a certified, licensed exterminator and treat entire area of building demolition and removal as well as entire area of all building additions in accordance with governing health regulations for rodent and insect control.

3.3 Salvaged Materials

- A. General: Salvaged Items are those so indicated on Drawings or Schedules, or as listed in this Section. Carefully remove salvaged items; clean and protect until disposition.
 1. Items to be incorporated into new work: Store until required for installation or for required modification or restoration.
 2. Other salvage items: Turn over to Owner and obtain receipt.
- B. Salvage items damaged during demolition shall be replaced by the Contractor with equivalent new items at no cost to the Owner.

3.4 Disposal of Demolished Materials

- A. General: Remove from building site debris, rubbish and other materials resulting from demolition operations. Transport and legally dispose off-site.
 1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.

SECTION 01770 - SELECTIVE DEMOLITION

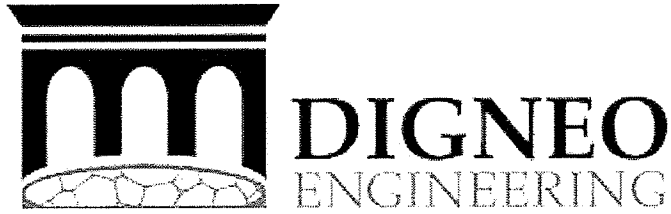
2. Burning of removed materials is not permitted on project site.

3.5 Cleanup and Repair

A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 01770



Geotechnical Engineering Report
Paul W. Carleton Elementary School Site Improvements

Prepared For:

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Prepared By:

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- F PRIVATE UTILITY LOCATING FIELD SKETCH



1. INTRODUCTION

This report was prepared by Digneo Engineering, LLC (DE), on behalf of Environmental Resolutions, Inc. (ERI), and contains the results of a subsurface geotechnical investigation conducted at the location of proposed site improvements for the Paul W. Carleton Elementary School. The purpose of this investigation was to assess the suitability of the existing subsurface soil conditions to support the proposed site development scheme. Our scope of work included a subsurface exploration, a laboratory testing program, and geotechnical engineering analyses. This report summarizes the work completed and provides foundation recommendations along with our general construction recommendations.

2. SITE & PROJECT DESCRIPTION

2.1 EXISTING CONDITIONS

The project site is located at Block 141, Lot 2, locally known as 251 East Maple Avenue, in Penns Grove Township, Salem County, New Jersey (see Attachment A – *Key Map Plan*). The subject property is developed and contains the Paul W. Carleton Elementary School, site improvements such as bituminous asphalt pavement (asphalt) drive lanes and parking, and the remainder of the property grass areas. The project site is bordered by East Maple Avenue to the southwest, South Smith Avenue to the southeast, an open, grass field to the northeast, and a residential development known as Penns Grove Gardens to the northwest.

The Delaware River, which is a tidal water body, is approximately 1,000 feet west of the elementary school.

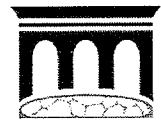
Based on the site plan prepared by ERI titled *Concept Plan*, dated September 17, 2024, site grades appear to peak centrally at approximately Elevation (EL) 13 feet then slope gently downward to about EL 10 feet to the west and EL 6 to the east. Vertical elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

2.2 PROJECT DESCRIPTION

The project is expected to consist of the construction of a 16,000 square feet (SF) 1-story classroom addition with a linked corridor. The building addition is expected to consist of masonry construction and steel bar joist roof. The average building height is reported as approximately 14 feet. The building addition is further expected to contain a concrete slab-on-grade. The interior and exterior footings are expected to be strip footings.

The Request for Proposal for the project (RFP) has stated that building loads are anticipated to be as follows:

- | | |
|------------------------------------|---------------------------|
| 1. Exterior bearing walls | approximately 3.7 kips/ft |
| 2. Interior corridor bearing walls | approximately 2.3 kips/ft |



The client indicated the Finish Floor Elevation (FFE) of the building addition will be established at Elevation 12.38 feet. Based on the existing grades, minimal cuts and fills on the order of 1 feet to 2 feet will be required to reach the slab subgrade elevations of the addition.

Should the actual loads or expected cuts and fills be different than those assumed above, DE should be contacted so we may review our conclusions and recommendations and revise this report if necessary.

3. GEOLOGY

Based on the Surficial Geologic Map of New Jersey, the site is underlain by the soils of the Cape May Formation (Geologic Symbol: Qcm3). According to the description provided by United States Geologic Survey (USGS), the soils of the Cape May Formation are typically comprised of sand and pebble gravel with varying amounts of silt, clay, and peat.

4. LABORATORY TESTING

Soil samples obtained during the test boring operations were reviewed and visually classified. To further define the physical characteristics of the encountered soils, four representative soil samples were subjected to laboratory analysis. The analyses conducted on these samples consisted of the following:

- Natural Moisture Content Testing (ASTM D2216)
- Sieve Analysis (ASTM D6913)
- Atterberg Limits Determination (ASTM D4318)

The results of this testing are presented in the following table, and the Lab Testing Report is enclosed as Attachment E.

Laboratory Test Results											
Location	Depth (ft)	Layer ID	% Gravel	% Sand	% Fines	LL	PL	PI	% Natural Moisture Content	% Organic Content	ASTM Group Name/Symbol
B-2	4 to 6	Stratum I	2.1	74.3	23.6	15	12	3	9.9	NA	Silty SAND (SM)
B-5	13 to 15	Stratum II	0.0	4.2	95.8	66	21	45	39.4	5.8	Fat/Organic CLAY (CH/OH)
B-101	4 to 6	Stratum I	0.0	86.6	13.4	NP	NP	NP	5.6	NA	Silty SAND (SM)
B-103	13 to 15	Stratum I Interbed	0.0	13	87	44	19	25	32.6	NA	Lean CLAY (CL)

LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index, NP = Non-Plastic



5. SUBSURFACE INVESTIGATION

All requested test boring locations were scanned for the presence of underground utilities prior to starting the excavation. A test boring was relocated at least 5 feet if the requested location was in conflict with any identified underground utilities. Underground water, telecommunication, and electric utilities were all located within the footprint of the proposed school addition. Refer to the *Subsurface Utility Field Sketches* prepared by Trinity Subsurface LLC and included as Attachment F for additional details.

A subsurface geotechnical investigation was performed to evaluate the soil conditions beneath the project site. A total of 11 test borings, referenced as B1 through B-5 and B-101 through B-106, and one test pit, referenced as FTP-1, were completed within the project site. Test borings B-1 through B-5 and FTP-1 were performed in August 2024. Test borings B-101 through B-106 were performed in October 2024 after the proposed building addition footprint location was revised.

All test borings and the foundation test pit are shown on the *Exploration Location Plan* presented as Attachment B. The test borings were advanced to depths ranging from approximately 10 feet to 40 feet below existing ground surface. The borings were located in the field by DE based on the locations requested by the client or as close as the existing surface conditions would permit.

Due to site conditions, the test borings were conducted utilizing an All-Terrain Vehicle (ATV) mounted drill rig equipped with hollow stem augers and split spoon samplers. The split spoon samples were conducted in accordance with ASTM D1586, were recovered at appropriate intervals throughout the test borings, and Standard Penetration Test (SPT) values were recorded for each soil sample. SPT values are the number of blows required to drive a 2 inch outer-diameter, split barrel sampler 24 inches using a 140-pound weight dropped 30 inches. The number of blows required to advance the sampler over the 12-inch interval from 6 inches to 18 inches is considered the "N" value.

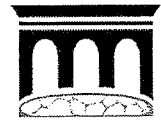
Descriptions of the subsurface conditions encountered are provided in the following sections of this report. Additional details regarding the encountered soils, obtained soil samples, and other subsurface information obtained in the test boring program are located in the *Test Boring Logs*, presented as Attachment C.

The foundation test pit was conducted along an exterior wall of the existing building in order to observe the existing building foundations. The test pit was excavated with hand tools until the bottom of the footing was revealed. A sketch of the existing building foundation at FTP-1 is presented as Attachment D.

Oversight of the field exploration operations were provided by a representative of DE.

5.1 SURFICIAL MATERIAL

Topsoil was encountered at the ground surface at test boring locations B-3, B-101, and B-102 and was measured to be approximately 8 inches to 9 inches in thickness. Bituminous asphalt pavement (asphalt) was encountered at the remaining test boring locations and was measured to be approximately 2 inches to 4 inches in thickness and bearing directly on the underlying subgrade soils.



Variations in the thickness and type of surficial material should be expected within the unexplored portions of the site.

5.2 STRATUM I

Stratum I was encountered below the surficial layer and extended to depths of approximately 10 feet to 22 feet below existing grades. Stratum I consisted primarily of varicolored fine to coarse SAND with varying amounts of Gravel, Silt and Clay. The recorded “N” values indicated this layer was in a very loose to medium dense state of relative density.

A layer of medium stiff dark gray Silty CLAY with varying amounts of Sand was interbedded within Stratum I at test boring location B-103 from about 13 feet to 19 feet below existing ground surface and B-104 from about 13 feet to 14 feet below existing ground surface.

Laboratory testing conducted on two representative samples of Stratum I indicate this soil is well graded and ranged between non plastic and slightly plastic. The samples had as-received natural moisture contents of 5.6 percent and 9.9 percent. This soil was classified using the Unified Soil Classification System (USCS) as Silty SAND (SM).

Laboratory testing conducted on one representative sample of the Stratum I Interbed indicate this soil is poorly graded and highly plastic. The sample had an as-received natural moisture content of 32.6 percent and a plasticity index of 25. This soil was classified using the Unified Soil Classification System (USCS) as a Lean Clay (CL).

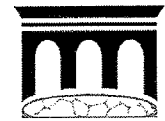
5.3 STRATUM II

Stratum II was encountered below Stratum I in test borings B-3, B-5, and B-102 and extended to depths of approximately 20 feet to 35 feet below existing grades. Stratum II consisted primarily of varicolored SILTY CLAY with varying amounts of fine Sand. The recorded “N” values indicated this layer was in a soft to stiff state of consistency.

Laboratory testing conducted on one representative sample of Stratum II indicate this soil is poorly graded and highly plastic. The sample had an as-received natural moisture content of 39.4 percent, plasticity index of 45, and an organic content of 5.8 percent. This soil was classified using the Unified Soil Classification System (USCS) as a Fat Clay / Organic Clay (CH/OH) .

5.4 STRATUM III

Stratum III was only encountered below the soils of Stratum II at test borings B-5 and B-102 and extended to at least the termination depth of approximately 40 feet below existing grades. This stratum consisted primarily of light brown to orangish brown fine to medium SAND with varying amounts of Gravel and Silt. The documented “N” values indicated Stratum III was in a loose state of relative density.



5.5 GROUNDWATER

Groundwater was encountered within the test borings at depths ranging between 5.5 feet to 8.5 feet below existing ground surface. A temporary well point was installed in test boring location B-105, and the groundwater depth was to be 8.5 feet below existing ground surface at the end of the day. These depths corresponded to groundwater elevations between approximately 1.5 feet to 5.5 feet. These observations were made at the time the test borings were completed, and groundwater table elevations will vary with daily, tidal, seasonal, and climatological conditions.

6. GEOTECHNICAL CONCLUSIONS & RECOMMENDATIONS

The geotechnical investigation has revealed the general subsurface profile underlying the proposed school addition footprint is comprised of the naturally-occurring soils of Stratum I, Stratum II, and Stratum III.

Provided the recommendations detailed in this report are followed, the firm and stable naturally occurring soils of Stratum I, or newly placed structural fill (placed as described in this report), are suitable for support of the proposed additions on conventional shallow foundations.

Details regarding our geotechnical conclusions and recommendations are provided in the following sections.

6.1 FOUNDATIONS

Foundation recommendations for this project are provided below.

- Shallow strip and/or spread foundations are suitable for support of the proposed building addition.
 - As previously referenced, portions of the near-surface soils of Stratum I are very loose to loose, particularly in the areas of B-101 and B-102. Any weak and yielding foundation subgrade soils encountered that cannot be improved in-place shall be over-excavated from within the foundation subgrade areas a minimum 12 inches to firm and stable subbase soils. The resulting over-excavation shall be backfilled back to the planned foundation subgrade elevation with clean ¾ inch stone and compacted with a trench roller.
- The foundations shall be supported on the firm and stable soils of Stratum I or structural fill placed in accordance with the recommendations in this report.
- The foundations for the proposed building shall be designed for a **maximum allowable bearing pressure of 2,000 pounds per square foot (psf)**, based on column and wall foundations being a minimum of 3 feet and 1.5 feet in width, respectively.



- Exterior foundations shall rest on soils no less than 3 feet below final exterior grade to protect against frost heave. Interior foundations located in permanently heated portions of the structure may be established at conventional depths below the floor slab, provided that they are established within the intended bearing stratum.
- At the proposed juncture of the existing building and proposed building addition, the elevation of the bottom of the new foundations should match those of adjacent portions of the existing buildings.
- In addition, we recommend that the shallow foundations bear below a zone bounded by a plane that extends outward and upward on a 1:1 slope from any proposed or existing underground utility excavation or other underground features.
- Foundation subgrades shall be cleared of loose material or debris immediately prior to the placement of concrete.
- We recommend that no footings be excavated that cannot be poured on the same day.

The foundation subgrades shall be reviewed by a Geotechnical Engineer licensed in the State of New Jersey during construction to confirm the suitability of the subgrade soils.

6.2 SETTLEMENT

For the purposes of our settlement analyses, maximum wall loads of 4 kips per linear foot were considered. Based on these loads, recommended bearing pressures, and our geotechnical analyses, maximum post-construction settlement was expected to be less than 1 inch with differential settlements less than approximately 0.5 inches. Differential settlement may approach total settlement

Should the foundation loads exceed those described above, DE shall be contacted so that we may review our analyses and revise our conclusions, if required.

6.3 LATERAL EARTH PRESSURES

The following data is provided for the design of any below-grade walls which may be constructed at the site and is based on the use of on-site soils placed under engineering control for backfill.

Stratum I

Soil Unit Weight $\gamma = 115$ pcf

Cohesion $C = 0$ psf

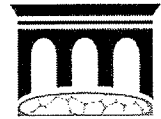
Angle of Internal Friction $\phi = 30$ degrees

Coefficient of Active Pressure $K_a = 0.33$

Coefficient of Passive Pressure $K_p = 3.00$

Coefficient of At-Rest Pressure $K_o = 0.50$

Should different soil be used, design data shall be re-evaluated and revised, if required, based on the specific material.



6.4 FLOOR SLAB

The floor slab for the proposed building addition may be constructed as a conventional slab on ground, supported on the firm and stable soils of Stratum I or Structural Fill placed in accordance with the recommendations set forth in this report. Provided the soils supporting the slab are compacted to at least 95 percent of their maximum dry density and within ± 2 percent of the optimum moisture content, both as determined by ASTM D1557, the soils are expected to exhibit a modulus of subgrade reaction of approximately 125 pounds per cubic inch (pci).

Any localized areas which contain weak and yielding Stratum I soils that cannot be improved in place shall be removed a minimum of 12 inches. The resulting over-excavations shall be proofrolled and backfilled as detailed later in this report. The Geotechnical Engineer of Record shall be present to review the slab subgrade area during its preparation and prior to slab subgrade placement.

The slab should be supported on a layer of free-draining crushed stone or washed gravel subbase, a minimum of 6 inches in thickness, which is compacted to non-movement prior to placement of the slab concrete. The porous sub slab layer provides a capillary break between the slab and the underlying subgrade soils. A vapor retarding membrane should be placed immediately below the floor slab concrete in all areas of the additions where floor finishes will be applied.

6.5 SEISMIC SITE CLASSIFICATION

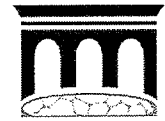
Based on the subsurface conditions encountered during our investigation at the site, and the guidance provided by “The 2021 International Building Code, New Jersey Edition”, the subsurface soils can be classified as Seismic Site Class D.

7. EXISTING FOUNDATIONS

DE oversaw the completion of one test pit, referenced as FTP-1. This test pit was excavated with hand tools and was conducted to expose portions of the existing exterior wall foundations where the new addition will abut the existing building. DE provided oversight of the test pit and found the top of the wall foundation was approximately 15 inches below the top of the ground surface. The wall foundation was further found to be approximately 13 inches in height. The wall foundations projected approximately 4 inches away from the building’s masonry foundation wall. Assuming a symmetric foundation, this suggests the existing wall foundations are at least 8 inches wider than the thickness of the exterior wall.

Based on the observed subsurface soil conditions underlying the existing foundations explored, and the dimensions and depth of the existing foundation, the allowable bearing capacity of the soils underlying these foundations can be expected to be 2,000 PSF.

A sketch, showing the information gathered regarding the existing foundation within FTP-1, is attached to this report as Attachment D.



8. CONSTRUCTION PHASE RECOMMENDATIONS

Based on our geotechnical engineering analyses for this project and our experience with similar projects, the following construction phase recommendations are offered in the following sections.

8.1 SITE PREPARATION

All surficial topsoil, asphalt, or other surficial materials shall be removed from all structural areas at the beginning of the project. Structural areas are defined as areas covered by the proposed addition or any asphalt or concrete pavement, extending a minimum of five feet beyond the proposed additions or pavement lines. Unstable or deleterious materials shall be removed from within these areas as detailed in this report.

Any existing underground or above-ground utility locations which lie within the footprints of the proposed addition should be verified in the field and relocated or abandoned as necessary, prior to construction. If the option to abandon below-grade utilities in-place is chosen, we recommend a lean cement grout (minimum 1,000 psi) be used to fill the utility lines.

8.2 COMPACTION AND PROOFROLLING

Structural areas beyond 8 feet from the existing structures, can be proofrolled and recompacted using larger equipment such as a steel-drum vibratory roller having a minimum static weight of at least 10 tons, if possible. In structural areas within 8 feet of the existing buildings, smaller compaction equipment, such as a dual drum walk-behind vibratory roller or similar equipment should be utilized. This should be done following removal of the surficial materials discussed above and following any excavation needed to reach proposed subgrade elevations prior to the placement of any structural fill.

A minimum of five overlapping passes of the compaction equipment shall be completed across all structural areas. **Compaction and proofrolling of the virgin subgrade soils should be completed under the observation of the Geotechnical Engineer of Record and is considered a critical part of site development.**

The compaction and proofrolling procedures described above are necessary to verify the stability of the upper zones of the soils underlying structural areas and aid in uniform distribution of loads. In areas where removal of soils (cut) is required, this procedure can be postponed until after the proposed subgrade elevation is achieved.

As previously referenced, portions of the near-surface soils of Stratum I were very loose to loose, particularly in the areas of B-101 and B-102. As such, the compaction and proofrolling procedures detailed above are vitally important to the performance of this project. In addition, due to these very loose soils, some localized areas of weak and yielding subgrade soils, requiring remediation, should be expected.



8.3 EXCAVATION CONSIDERATIONS

Excavations for this project are expected to take place within the soils of Stratum I. Based on our findings, these soils are expected to be removed using conventional excavation equipment and techniques.

All excavations shall be adequately sloped, benched, or otherwise supported to minimize collapse and protect personnel. In addition, all excavations shall be completed in accordance with all pertinent Occupational Safety and Health Administration (OSHA) guidelines and requirements.

8.4 STRUCTURAL FILL

Recommendations regarding imported structural fill and the use of on-site soils as structural fill are provided in the following sections.

Imported Fill

Any imported structural fill required to raise site grades or replace weak and yielding soils should be free of ash, trash, cinders, organic matter, or any other deleterious materials. The structural fill should have a Plasticity Index (PI) less than 10, a Liquid Limit (LL) less than 30, and contain less than 15 percent by weight rock fragments larger than 2 inches with no particle size exceeding 4 inches. It shall also be well-graded with less than 30 percent by weight larger than $\frac{3}{4}$ inches and less than 15 percent smaller than the No. 200 sieve.

The Geotechnical Engineer of Record should evaluate any proposed imported soils that differ from above prior to their placement as Structural Fill.

On-Site Soils Reuse

Comments regarding the suitability of the on-site soils for reuse as structural fill are provided below.

Stratum I – These soils consisted primarily of varicolored fine to coarse SAND with varying amounts of Gravel, Silt and Clay. These soils are considered suitable for use as structural fill, provided they are placed in accordance with the recommendations set forth in this report.

Stratum II & III – These soils are **not** expected to be available during construction.

Our analysis of the suitability of the on-site soil for use as structural fill was based on data collected from the test boring location completed at the site. Soil suitability shall be confirmed in the field by a qualified Geotechnical Engineer during construction.



8.5 BACKFILLING REQUIREMENTS

The following structural fill lift thicknesses can be used with the following compaction equipment:

- Loose lifts not exceeding 10 inches: Where Heavy Compaction Equipment can be utilized.
- Loose lifts not exceeding 6 inches: Where only hand operated tampers or walk-behind rollers can be utilized.

Within structural areas, all structural fill shall be compacted to at least 95 percent of the maximum dry density and within ± 2 percent of the optimum moisture content, both as determined by ASTM D1557.

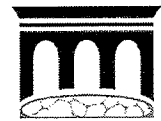
Within non-structural areas, all structural fill shall be compacted to at least 90 percent of the maximum dry density, and within ± 2 percent of the optimum moisture content, both as determined by ASTM D1557.

The lift thicknesses, number of passes, and the type of compaction equipment needed to achieve the compaction percentages noted above can be adjusted in the field during backfilling and compaction procedures. Further, we recommend only hand-tampers and walk-behind rollers be utilized during compaction adjacent to any existing foundations, unless the Structural Engineer of Record for the project has reviewed the situation and has stated that heavy compaction equipment can be utilized in these areas.

8.6 FOUNDATION CONSTRUCTION

The following shall be adhered to during foundation construction at the site:

- Foundation subgrades should be compacted using a walk-behind roller, hand-operated tamper, or similar excavation-appropriate compaction equipment to provide a firm and stable subbase suitable for proper support of the proposed foundations.
 - **As previously referenced, portions of the near-surface soils of Stratum I were very loose to loose and some localized areas of weak and yielding subgrade soils should be expected. As such, the compaction procedures detailed above are vitally important to the performance of this project.**
- Should the foundation subgrade soils be disturbed, they should be recompact in place or removed to firm and stable subgrade soils. The resulting over-excavation can be backfilled with concrete, flowable cementitious fill or structural fill placed in accordance with this report.
- Water shall be prevented from entering the foundation excavations. Any water that does enter the foundation excavation shall be removed within 24 hours and the subgrade soils re-evaluated for stability.
- It is strongly recommended foundation excavation and concrete placement take place on the same day.
- Attention is directed to Section 6.1 of this Report. All recommendations therein shall be adhered to.



The foundation subgrades shall be reviewed by a Geotechnical Engineer licensed in the State of New Jersey during construction to confirm the suitability of the subgrade soils.

8.7 SLAB CONSTRUCTION

Prior to the placement of any granular subbase or placement of the concrete slab, proofrolling and compaction of the proposed concrete slab subgrade area should be carried out in accordance with this report.

Dependent upon the weather conditions and construction schedules, the slab subgrade may contain weak, yielding and/or otherwise unstable soil immediately prior to slab construction. These soils may be removed and replaced in accordance with this report, or alternate methods, such as aerating and re-compacting, may be utilized to stabilize the slab subgrade. The most appropriate method used for stabilization of the slab subgrade shall be determined in the field based on site-specific field and soil conditions, as well as the availability and cost effectiveness of various methods. The Geotechnical Engineer shall be consulted should these needs arise.

Based on the results of our investigation, some localized areas of weak and/or yielding slab subgrades, requiring excavation and replacement, should be expected. Any excavation and replacement of weak and/or yielding slab subgrade soils should be carried out as detailed previously in this report. The Geotechnical Engineer of Record shall be present to review the slab subgrade area during its preparation and prior to slab subgrade placement.

8.8 DEWATERING

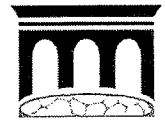
Groundwater was encountered within all test borings at the site. Groundwater was encountered at depths ranging from approximately 5.5 feet to 8.5 feet below existing ground surface; which correspond to groundwater elevations ranging from approximately 1.5 feet to 5.5 feet. As such, dewatering efforts may be necessary for this project if foundation or utility excavations exceed a depth of 5 feet below existing ground surface.

The potential exists for temporary tidally influenced groundwater levels to be encountered shallower at various times of the year. It is anticipated any encountered groundwater encountered at shallower depths during high tide events shall be able to be controlled using localized drainage ditches and submersible pumps.

These observations were made at the time the borings were drilled, and groundwater table elevations will vary with tidal, daily, seasonal, and climatological conditions.

8.9 PAVEMENT CONSTRUCTION

Prior to any newly placed bituminous pavement, proposed pavement areas shall be thoroughly compacted and proof-rolled in accordance with this report. These areas shall be compacted to a minimum 95 percent of the maximum dry density and within ± 2 percent of the optimum moisture content, both as determined by ASTM D1557. This process, and the removal and replacement of any weak and yielding areas of the pavement subgrade, shall be reviewed by the Geotechnical Engineer during construction.



The granular subbase portion of the proposed paving section shall be placed as soon as possible after the subgrade has been reviewed and approved by the Geotechnical Engineer. Exposure to construction traffic prior to paving will likely result in degradation of the subbase materials and instability of the subgrade soils.

The proofrolling and compaction procedures detailed in this report are considered vitally important to the performance of the paving at this project. Any areas of weak and yielding paving subgrade soils encountered within the paved areas shall be removed in their entirety to firm and stable Stratum I soils. The resulting over-excavations shall be proofrolled and backfilled as detailed in this report. The Geotechnical Engineer of Record shall be present to review the paving subgrade areas during their preparation.

Proper drainage is required for the successful performance of any pavement. It is assumed the pavement will be designed for proper grading to provide proper runoff.

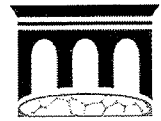
Review of all pavement construction activities, including review of the gravel subbase layer and the pavement subgrades, shall be reviewed by a Geotechnical Engineer to ensure adherence to project plans, specifications and recommendation contained in this report.

Based on the results of our investigation, some localized areas of weak and/or yielding pavement subgrades, requiring excavation and replacement, should be expected. Any excavation and replacement of weak and/or yielding pavement subgrade soils should be carried out as detailed previously in this report.

9. CONSTRUCTION PHASE OBSERVATIONS AND TESTING

As Geotechnical Engineer of Record for this project, DE recommends we be retained to provide construction phase observations and materials testing during construction. This shall be done to verify that the geotechnical recommendations detailed in this report are adhered to during construction.

If an outside firm is retained to provide these services, DE recommends this firm prepare a letter stating they will assume the responsibilities of Geotechnical Engineer of Record for the project. Further, we also recommend this firm provide a letter stating their receipt of this report and acknowledgement of the recommendations provided therein, or detailing revisions to the recommendations within our report.



10. LIMITATIONS

This report was prepared in accordance with generally accepted geotechnical practices for projects such as this one.

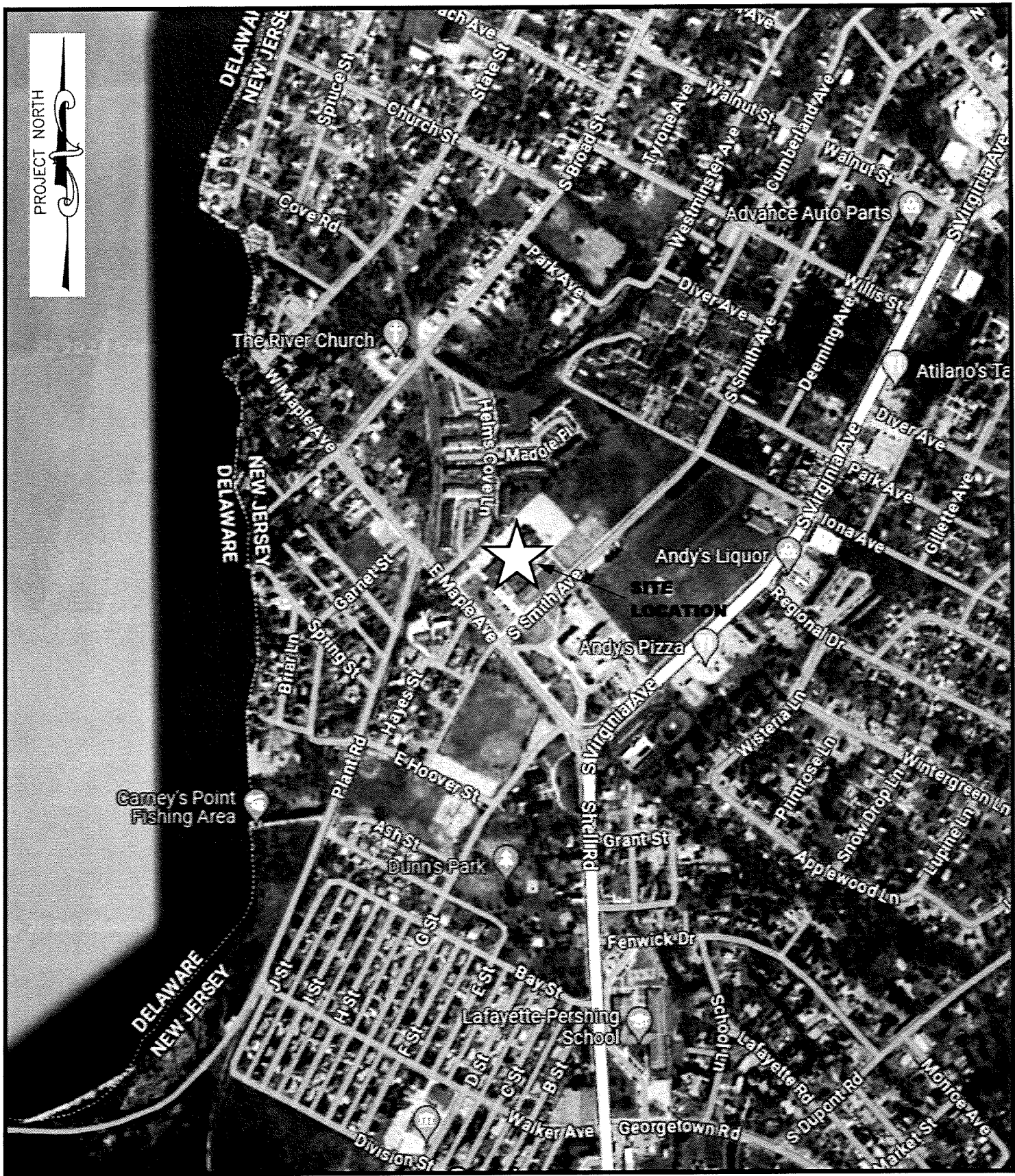
The conclusions and recommendations contained in this report were based upon the subsurface data obtained at the site. Soil conditions may vary from location to location and from point to point across the project site. The validity of the conclusions and recommendations contained in this report were limited by the scope of the field investigation and by the number of test borings completed. It is understood the number of test locations were consistent with good engineering practice; however, given the nature of subsurface conditions, there was a possibility actual encountered conditions may differ significantly from those described in this report.

Should the conditions encountered differ from those described in this report, DE shall be notified immediately so our conclusions and recommendations can be reviewed and revised, if required. The scope of this investigation was limited to the geotechnical analysis of the load-carrying capabilities and stability of the soils underlying the project area.

Oil, hazardous waste, radioactivity, irritants, pollutants, radon or other dangerous substances and conditions were not the subject of this study. Their presence and/or absence are not implied, inferred or suggested by this report or results of this study.

Attachment A

Key Map Plan



PROJECT:

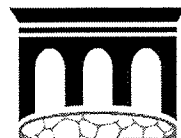
**GEOTECHNICAL ENGINEERING INVESTIGATION
 PAUL W. CARLETON ELEMENTARY ADDITION
 BLOCK 141, LOT 2
 251 EAST MAPLE AVENUE
 PENNS GROVE, SALEM COUNTY, NEW JERSEY
 DE PROJECT NO. 157-103.1**

DRAWING TITLE:

**KEY MAP
 PLAN**

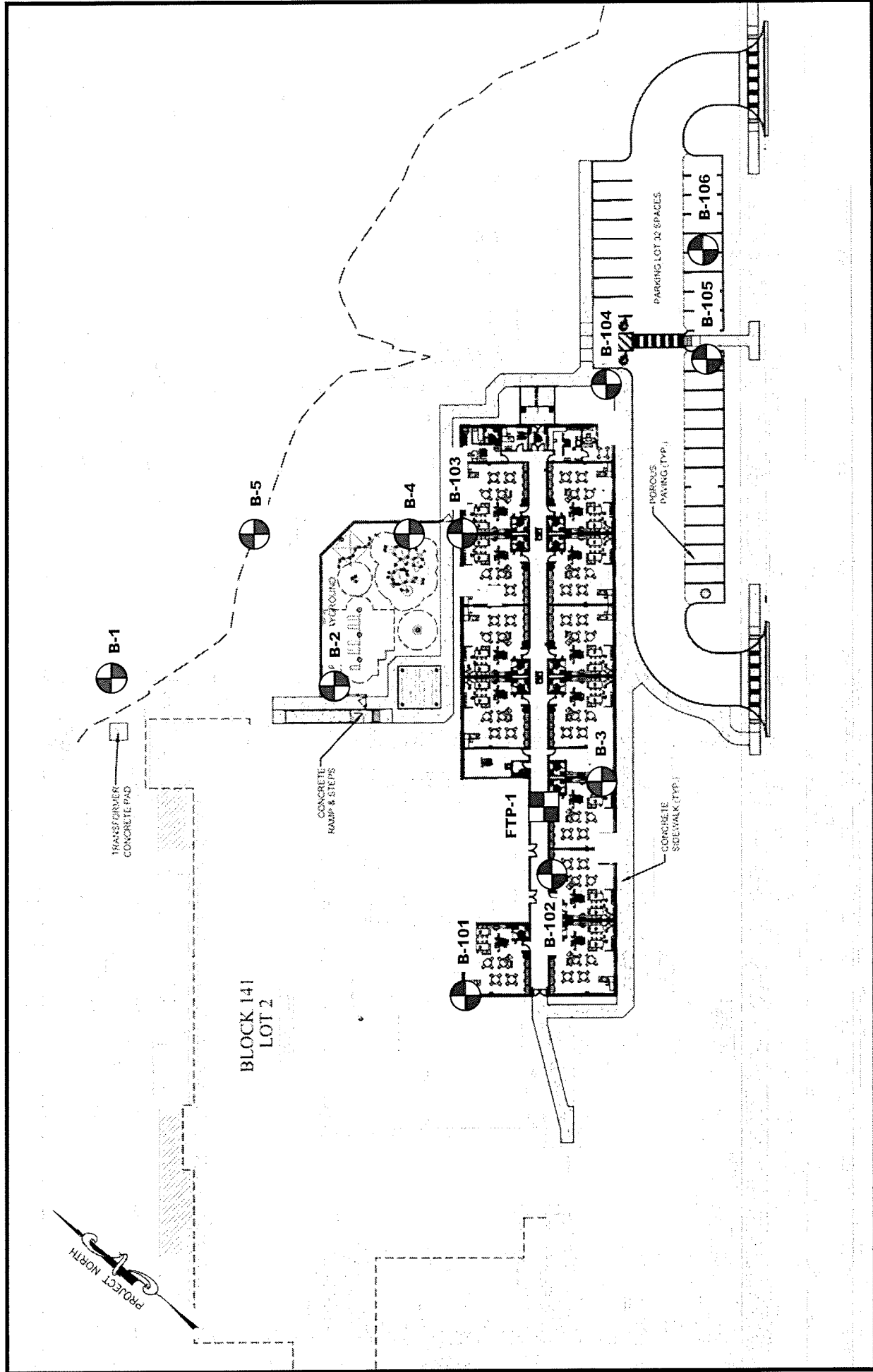
DRAWING SHEET:

ATTACHMENT 'A'



**DIGNEO
 ENGINEERING**

Attachment B
Exploration Location Plan



APPROXIMATE FOUNDATION TEST PIT LOCATION (AUGUST 2024)

APPROXIMATE TEST BORING LOCATION (AUGUST 2024)

APPROXIMATE TEST BORING LOCATION (OCTOBER 2024)



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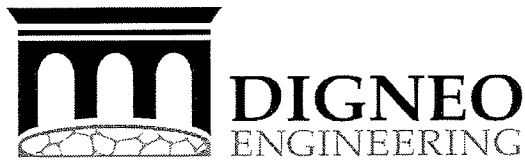
EXPLORATION LOCATION PLAN

ATTACHMENT 'B'

PROJECT:

GEOTECHNICAL ENGINEERING INVESTIGATION
 PAUL W. CARLETON ELEMENTARY ADDITION
 BLOCK 141, LOT 2
 251 EAST MAPLE AVENUE
 PENNS GROVE, SALEM COUNTY, NEW JERSEY
 DE PROJECT NO. 157-103.1

Attachment C
Test Boring Logs



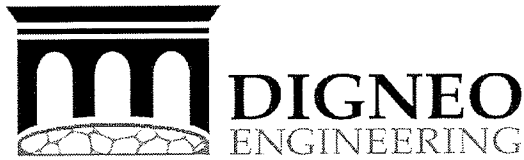
TEST BORING LOG

Project: <u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number: <u>B-1</u>
Date Drilled: <u>8/20/24</u>	GS Elevation (ft): <u>7.5</u>
Driller / DE Rep: <u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft): <u>1.5</u>
Rig Type: <u>Diedrich D-50 Turbo</u>	Drilling Method: <u>3.25" ID HSA</u>
Project Number: <u>157-103</u>	Topo Est: <u>X</u> Field Survey <u> </u>

Depth (ft)	Sample #	Sample Depth	Blows/6"			N	Soil Description	Remarks
			2	3	2			
1	S-1	0' - 2'		2	3	2	5	ASPHALT 4"
2								Medium stiff dark gray SILTY CLAY, some fine to medium Sand, moist
3	S-2	2' - 4'	1	2	2	1	4	Loose light brown fine to medium SAND, little fine Gravel, trace Silt, moist
4								
5	S-3	4' - 6'	2	2	1	2	3	No Recovery
6								
7	S-4	6' - 8'	7	9	11	14	20	Medium dense light brown fine to coarse SAND, little fine Gravel, trace Silt, wet
8								
9	S-5	8' - 10'	11	13	15	7	28	Medium dense light orange brown fine to coarse SAND and fine to coarse GRAVEL, trace Silt, wet
10								
11								
12								
13								
14	S-6	13' - 15'	6	8	8	7	16	Medium dense light orange brown fine to medium SAND, little Clayey Silt, wet
15								
16								
17								
18								
19	S-7	18' - 20'	10	8	10	12	18	Medium dense light gray fine to coarse SAND and fine to coarse GRAVEL, wet
20								
21								
22								
23								
24								
25								
END OF BORING AT 20 FEET								

H₂O : 6'
Depth :

Stratum I



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TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-2</u>
Date Drilled:	<u>8/20/24</u>	GS Elevation (ft):	<u>9.5</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>1.5</u>
Rig Type:	<u>Diedrich D-50 Turbo</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103</u>	Topo Est: <u>X</u>	Field Survey <u> </u>

Depth (ft)	Sample #	Sample Depth	Blows/6"			N	Soil Description	Remarks
1	S-1	0' - 2'		6	5	4	11	<p style="text-align: center;">ASPHALT 4"</p> <p>Medium dense orange brown fine to medium SAND, some Silt, moist</p> <p>Loose orange brown fine to medium SAND, some Silt, trace fine Gravel, moist</p> <p>Very loose tan brown fine to medium SAND, little Silt, moist</p> <p>Very loose light orange brown fine to medium Sand, some Silt, moist</p> <p>Very loose light grayish brown fine to medium SAND, little Silt, wet</p> <p>Medium dense orange brown fine to medium SAND, some Silty Clay, wet</p> <p>Medium dense light gray fine to medium SAND, trace Silt, wet</p> <p style="text-align: right;">H₂O Depth : 8'</p> <p style="text-align: right;">Stratum I</p>
2								
3	S-2	2' - 4'	2	3	3	3	6	
4								
5	S-3	4' - 6'	4	2	1	1	3	
6								
7	S-4	6' - 8'	1	2	1	1	3	
8								
9	S-5	8' - 10'	1	1	3	4	4	
10								
11								
12								
13								
14	S-6	13' - 15'	8	11	12	6	23	
15								
16								
17								
18								
19	S-7	18' - 20'	5	8	8	7	16	
20								
21								
22								
23								
24								
25								
END OF BORING AT 20 FEET								

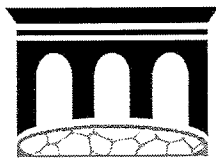


TEST BORING LOG

Project:	Carleton Elementary School Addition Geotechnical Investigation	Boring Number:	B-3
Date Drilled:	8/20/24	GS Elevation (ft):	12
Driller / DE Rep:	Sano Drilling Inc. / Antonio M. Digneo	GW Elevation (ft):	4
Rig Type:	Diedrich D-50 Turbo	Drilling Method:	3.25" ID HSA
Project Number:	157-103	Topo Est:	<input checked="" type="checkbox"/> Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
			2	5	7	5			
1	S-1	0' - 2'	2	5	7	5	12	TOPSOIL 8"	
2								Medium dense light brown fine to medium SAND, some Silt, moist	
3	S-2	2' - 4'	5	4	2	3	6	Loose light brown fine to medium SAND, some Silt, moist	
4									
5	S-3	4' - 6'	3	5	5	3	10	Loose orange brown fine to medum SAND, some Silt, trace Clay, moist	
6									
7	S-4	6' - 8'	4	6	6	7	12	Medium dense light brown fine to medium SAND, some Silt, trace fine Gravel, moist	
8									H ₂ O : 8' Depth
9	S-5	8' - 10'	5	6	5	6	11	Medium dense light brown fine to medium SAND, little Silt, trace fine Gravel, wet	
10									
11									Stratum I
12									
13									
14	S-6	13' - 15'	8	10	17	10	27	Medium desne orange brown fine to coarse SAND, some Silt, trace fine to coarse Gravel, wet	
15									
16									
17									
18									
19	S-7	18' - 20'	3	4	3	4	7	Medium stiff dark reddish brown SILTY CLAY, little fine Sand, moist	Stratum II
20									
21									
22									
23									
24									
25									

END OF BORING AT 20 FEET



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TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-4</u>
Date Drilled:	<u>8/20/24</u>	GS Elevation (ft):	<u>10</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>4</u>
Rig Type:	<u>Diedrich D-50 Turbo</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103</u>	Topo Est:	<u>X</u> Field Survey _____

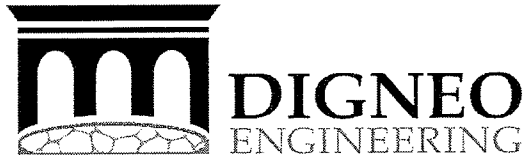
Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'			1/18"	1	ASPHALT 4"	H ₂ O Depth : 6' Stratum I	
2							Very loose orange brown fine to medium SAND, trace Silt, moist		
3	S-2	2' - 4'	2	3	4	4	7		Loose light grayish brown fine to medium SAND, some Silt, moist
4									
5	S-3	4' - 6'	3	6	6	5	12		Loose orange brown fine to coarse SAND, trace Silt, wet
6									
7	S-4	6' - 8'	2	4	5	5	9		Loose light grayish brown fine to coarse SAND, trace Silt, wet
8									
9	S-5	8' - 10'	9	9	9	9	18		Medium dense light grayish brown fine to coarse SAND, trace Silt, wet
10									
11									
12									
13									
14	S-6	13' - 15'	3	4	6	7	10		Loose dark gray fine to coarse SAND, trace Silt, wet
15									
16									
17									
18									
19	S-7	18' - 20'	3	7	8	10	15		Medium dense dark gray fine to coarse SAND, some fine to coarse Gravel, trace Silt, wet
20									
21									
22									
23									
24									
25									
END OF BORING AT 20 FEET									



TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-5</u>
Date Drilled:	<u>8/20/24</u>	GS Elevation (ft):	<u>8</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>2</u>
Rig Type:	<u>Diedrich D-50 Turbo</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103</u>	Topo Est: <input checked="" type="checkbox"/>	Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'		5	4	2	9	ASPHALT 4"	Stratum I H ₂ O : 6' Depth : 6'
2							Loose dark brown fine to medium SAND, some Silt, moist		
3	S-2	2' - 4'	1	2	1	2	3	Soft light gray CLAY, trace fine Sand, moist	
4									
5	S-3	4' - 6'	5	6	10	8	16	Medium dense gray fine to medium SAND, some fine to medium Gravel, moist	
6									
7	S-4	6' - 8'	5	9	11	15	20	Medium dense brown fine to medium SAND, some fine to medium Gravel, little Silt, wet	
8									
9	S-5	8' - 10'	15	13	18	13	31	Dense brown fine to medium SAND, some fine to medium Gravel, little Silt, wet	
10									
11									
12									
13								Stratum II	
14	S-6	13' - 15'	8	3	1	1	4		Soft dark gray SILTY CLAY, trace fine Sand, moist
15									
16									
17									
18									
19	S-7	18' - 20'	3	2	2	2	4		Soft dark gray SILTY CLAY, trace fine Sand, moist
20									
21									
22									
23									
24	S-8	23' - 25'	3	3	3	3	6		Medium stiff dark gray SILTY CLAY, trace fine Sand, moist
25									

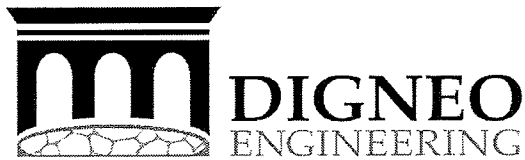


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TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-5</u>
Date Drilled:	<u>8/20/24</u>	GS Elevation (ft):	<u>8</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>2</u>
Rig Type:	<u>Diedrich D-50 Turbo</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103</u>	Topo Est: <u>X</u>	Field Survey <u> </u>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
26								Stiff dark gray SILTY CLAY, little fine Sand, moist	Stratum II
27									
28									
29	S-9	28' - 30'	2	3	7	10	10		
30									
31									
32									
33									
34	S-5	33' - 35'	4	4	3	2	7		
35									
36								Loose light brown to orangish brown fine to medium SAND, some fine to medium Gravel, trace Silt, wet	Stratum III
37									
38									
39	S-6	38' - 40'	4	4	5	10	9		
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
END OF BORING AT 40 FEET									

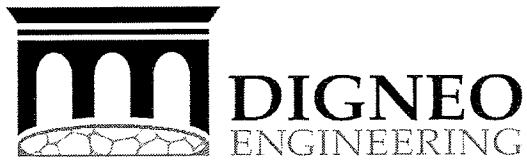


TEST BORING LOG

Project: <u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number: <u>B-101</u>
Date Drilled: <u>10/9/24</u>	GS Elevation (ft): <u>12.5</u>
Driller / DE Rep: <u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft): <u>4.5</u>
Rig Type: <u>Acker Rebel XL</u>	Drilling Method: <u>3.25" ID HSA</u>
Project Number: <u>157-103.1</u>	Topo Est: <u>X</u> Field Survey <u> </u>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
			5	4	3	5			
1	S-1	0' - 2'	5	4	3	5	7	TOPSOIL 9"	H ₂ O Depth : 8' Stratum I
2							Loose light brown fine SAND, some fine Gravel, moist		
3	S-2	2' - 4'	6	5	5	5	10	Loose orange brown fine SAND, some fine Gravel, moist	
4									
5	S-3	4' - 6'	3	2	2	2	4	Very loose orange brown fine to medium SAND, little Silt, moist	
6									
7	S-4	6' - 8'	3	2	1	3	3	Very loose orange brown fine to medium SAND, some Clayey Silt, trace fine Gravel, moist	
8									
9	S-5	8' - 10'	3	4	5	4	9	Loose light gray fine to coarse SAND, little fine Gravel, trace Silt, wet	
10									
11									
12									
13									
14	S-6	13' - 15'	8	7	7	5	14	Medium dense light gray fine to coarse SAND and fine to coarse GRAVEL, trace Silt, wet	
15									
16									
17									
18									
19	S-7	18' - 20'	2	2	2	3	4	Very loose light gray fine to coarse SAND and fine to coarse GRAVEL, trace Silt, wet	
20									
21									
22									
23									
24									
25									

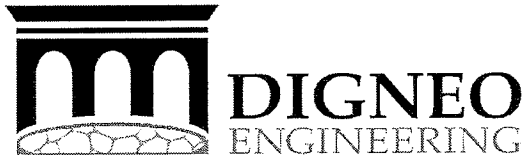
END OF BORING AT 20 FEET



TEST BORING LOG

Project: <u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number: <u>B-102</u>
Date Drilled: <u>10/9/24</u>	GS Elevation (ft): <u>12</u>
Driller / DE Rep: <u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft): <u>4</u>
Rig Type: <u>Acker Rebel XL</u>	Drilling Method: <u>3.25" ID HSA</u>
Project Number: <u>157-103.1</u>	Topo Est: <input checked="" type="checkbox"/> Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
			1	2	3	4			
26								Soft dark gray SILTY CLAY, trace fine Sand, moist SHELBY TUBE	Stratum II
27									
28									
29	S-9	28' - 30'	1	2	2	3	4		
30									
31	S-10	30' - 32'							
32								Loose light brown fine to medium SAND, trace Silt, wet	Stratum III
33									
34	S-11	33' - 35'	3	3	5	7	8		
35									
36									
37									
38								Loose light brown fine to medium SAND, trace fine Gravel, trace Silt, wet	
39	S-12	38' - 40'	4	3	4	5	7		
40									
41									
42									
43									
44								END OF BORING AT 40 FEET	
45									
46									
47									
48									
49									
50									

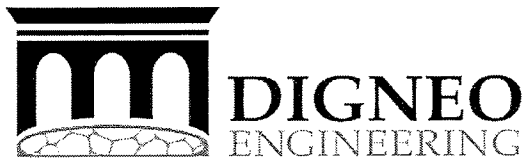


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TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-103</u>
Date Drilled:	<u>10/9/24</u>	GS Elevation (ft):	<u>11</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>5.5</u>
Rig Type:	<u>Acker Rebel XL</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103.1</u>	Topo Est:	<u>X</u> Field Survey <u> </u>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'	12	3	6	6	9	ASPHALT 4"	Stratum I H ₂ O Depth : 5.5'
2								Loose light brown fine to medium SAND, little Silt, moist	
3	S-2	2' - 4'	4	3	4	4	7	Loose dark gray to gray fine to medium SAND, some Silt, moist	
4									
5	S-3	4' - 6'	3	3	7	8	10	Loose light brownish gray fine to medium SAND, little fine to coarse Gravel, little Silt, moist to wet	
6									
7	S-4	6' - 8'	6	8	10	10	18	Medium dense light brown fine to coarse SAND, little fine Gravel, little Silt, wet	
8									
9	S-5	8' - 10'	10	17	17	17	34	Dense light brown fine to coarse SAND, some fine Gravel, little Clayey Silt, wet	
10									
11									
12									
13									
14	S-6	13' - 15'	9	3	3	2	6	Medium stiff dark gray SILTY CLAY, little fine to medium Sand, wet	
15									
16									
17								18' - 19': Medium stiff dark gray SILTY CLAY, little fine Sand, moist	
18									
19	S-7	18' - 20'	3	4	15	11	19	19' - 20': Medium dense gray fine to coarse SAND, some fine Gravel, little Silt, wet	
20									
21									
22									
23									
24									
25									
END OF BORING AT 20 FEET									

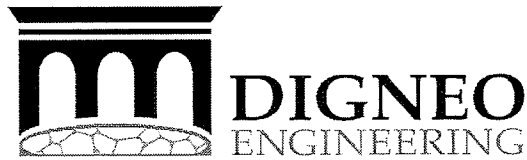


TEST BORING LOG

Project:	Carleton Elementary School Addition Geotechnical Investigation	Boring Number:	B-104
Date Drilled:	10/9/24	GS Elevation (ft):	11
Driller / DE Rep:	Sano Drilling Inc. / Antonio M. Digneo	GW Elevation (ft):	2.5
Rig Type:	Acker Rebel XL	Drilling Method:	3.25" ID HSA
Project Number:	157-103.1	Topo Est:	<input checked="" type="checkbox"/> Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'	10	4	7	6	11	ASPHALT 2"	
2								Medium dense orange brown to grayish brown fine to medium SAND, little fine Gravel, little Silt, moist	Stratum I
3	S-2	2' - 4'	6	3	3	3	6	Loose yellowish brown fine to medium SAND, little Silt, trace fine Gravel, moist	
4									
5	S-3	4' - 6'	4	4	3	3	7	Loose light brown fine to medium SAND, trace Silt, moist	
6									
7	S-4	6' - 8'	4	5	6	8	11	Medium dense light brown fine to medium SAND, trace Silt, trace fine Gravel, moist	
8									
9	S-5	8' - 10'	11	9	7	9	16	Medium dense grayish brown fine to medium SAND, little fine Gravel, trace Silt, wet	
10									
11									
12									
13								13' - 14': Medium stiff dark gray SILTY CLAY, little fine Sand, moist	
14	S-6	13' - 15'	2	3	4	4	7		
15								14' - 15': Loose gray fine to medium SAND, some Silt, wet	
16									
17									
18									
19	S-7	18' - 20'	2	3	3	4	6	Loose gray fine to medium SAND, some Clayey Silt, wet	
20									
21									
22									
23									
24									
25									
END OF BORING AT 20 FEET									

H₂O : 8.5'
Depth

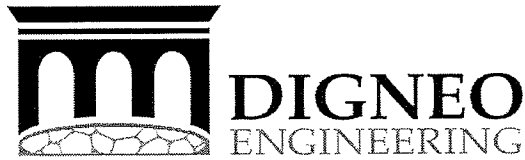


TEST BORING LOG

Project: <u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number: <u>B-105</u>
Date Drilled: <u>10/9/24</u>	GS Elevation (ft): <u>12</u>
Driller / DE Rep: <u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft): <u>3.5</u>
Rig Type: <u>Acker Rebel XL</u>	Drilling Method: <u>3.25" ID HSA</u>
Project Number: <u>157-103.1</u>	Topo Est: <input checked="" type="checkbox"/> Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'	16	4	8	8	12	ASPHALT 2" No Recovery	Stratum I SHGW : 6' Depth : 6' H ₂ O : 8.5' Depth : 8.5'
2									
3	S-2	2' - 4'	6	5	4	4	9	Loose yellowish brown fine to coarse SAND, little Silt, moist	
4									
5	S-3	4' - 6'	3	2	2	2	4	Very loose light brown fine to medium SAND, trace Silt, moist (few, fine, faint light gray mottles at 6')	
6									
7	S-4	6' - 8'	3	3	2	3	5	Loose light brown to gray fine to medium SAND, trace Silt, wet	
8									
9	S-5	8' - 10'	4	4	5	6	9	Loose gray to orange brown fine to medium SAND, some Silt, trace fine Gravel, wet	
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

END OF BORING AT 10 FEET



TEST BORING LOG

Project:	<u>Carleton Elementary School Addition Geotechnical Investigation</u>	Boring Number:	<u>B-106</u>
Date Drilled:	<u>10/9/24</u>	GS Elevation (ft):	<u>11.5</u>
Driller / DE Rep:	<u>Sano Drilling Inc. / Antonio M. Digneo</u>	GW Elevation (ft):	<u>3.5</u>
Rig Type:	<u>Acker Rebel XL</u>	Drilling Method:	<u>3.25" ID HSA</u>
Project Number:	<u>157-103.1</u>	Topo Est: <input checked="" type="checkbox"/> X	Field Survey <input type="checkbox"/>

Depth (ft)	Sample #	Sample Depth	Blows/6"				N	Soil Description	Remarks
1	S-1	0' - 2'	36	6	7	5	13	ASPHALT 6" Medium dense yellowish brown to brown fine to medium SAND, little fine Gravel, little Silt, moist	Stratum I SHGW Depth : 6.0' H ₂ O Depth : 8'
2									
3	S-2	2' - 4'	5	3	3	2	6	Loose brown fine to medium SAND, some Silt, moist	
4									
5	S-3	4' - 6'	3	3	3	2	6	Loose light yellowish brown fine to medium SAND, trace Silt, moist (few, fine, faint light gray mottles at 6')	
6									
7	S-4	6' - 8'	4	3	4	5	7	Loose light brown to grayish brown fine to medium SAND, trace Silt, wet	
8									
9	S-5	8' - 10'	5	5	6	7	11	Medium dense yellowish brown fine to medium SAND, trace Silt, wet	
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
END OF BORING AT 10 FEET									

Attachment D
Existing Foundation Sketch

BRICK

GRADE

15''

FOOTING

28''

13''

4''

CAST-IN-PLACE
CONCRETE

CONCRETE
FOOTING

NOT TO SCALE

PROJECT:

**GEOTECHNICAL ENGINEERING INVESTIGATION
PAUL W. CARLETON ELEMENTARY ADDITION
BLOCK 141, LOT 2
251 EAST MAPLE AVENUE
PENNS GROVE, SALEM COUNTY, NEW JERSEY
DE PROJECT NO. 157-103.1**

DRAWING TITLE: DRAWING SHEET:

**SKETCH OF
EXISTING
FOUNDATION**

ATTACHMENT 'D'



Attachment E
Laboratory Test Results

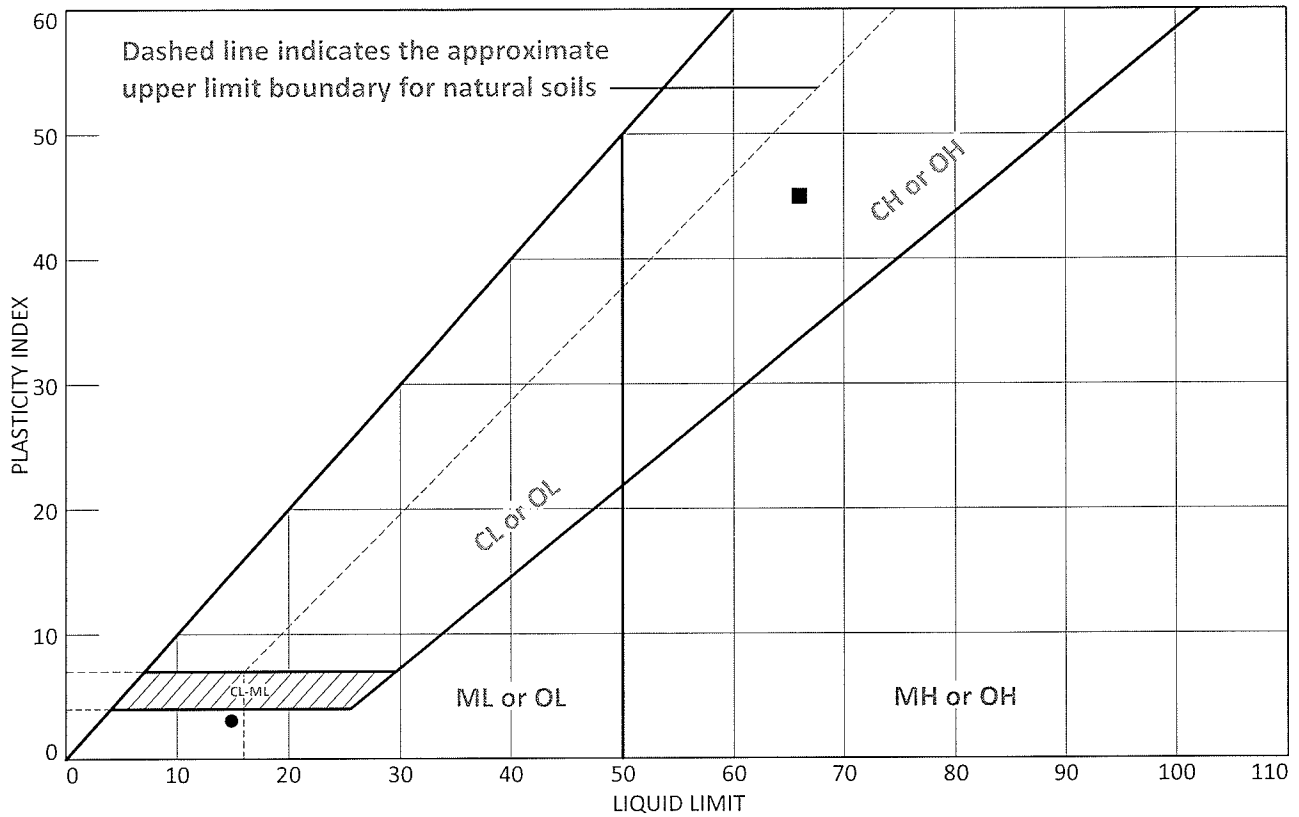


SUMMARY OF LABORATORY TEST DATA

Project Name: Carleton ES Addition Geotech
DE #157-103
 Client Name: Digneo Engineering
 TRC Project #: 617654.0014

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION USCS GRADATION				PLASTICITY				ORGANIC CONTENT (%)
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)	
B-2	S-3	4.0-6.0	SM	9.9	2.1	74.3	23.6	15	12	3	-0.7	-	
B-5	S-6	13.0-15.0	CH/OH	39.4	0.0	4.2	95.8	66	21	45	0.4	5.8	

Atterberg Limits and Moisture Content Report



SOIL DATA

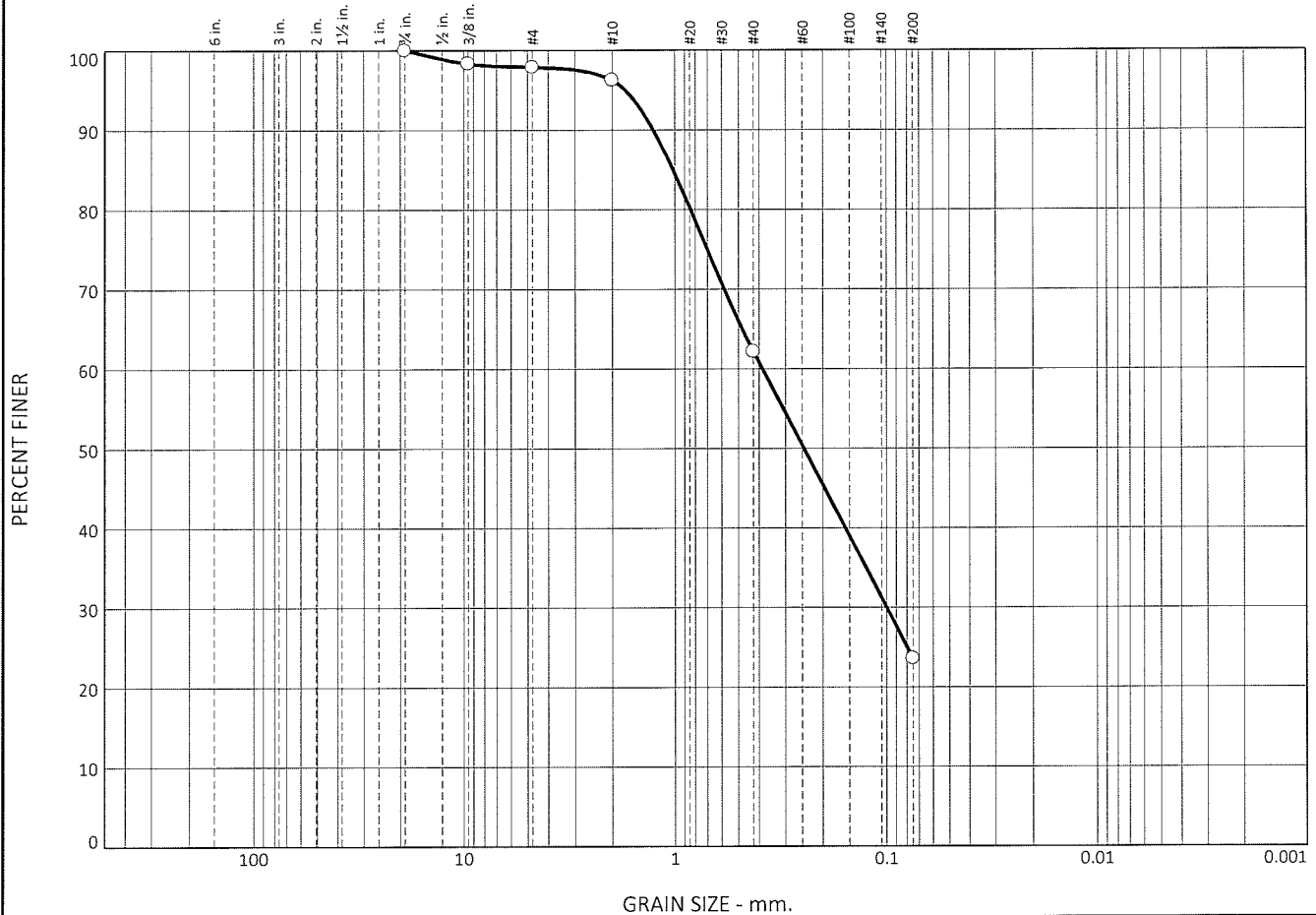
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-2	S-3	4.0-6.0 FT	9.9	12	15	3	-0.7	SM
■	B-5	S-6	13.0-15.0 FT	39.4	21	66	45	0.4	CH/OH

TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: DIGNEO ENGINEERING
Project: CARLETON ES ADDITION GEOTECH
 DE #157-103
Project No.: 617654.0014

Figure 1

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	2.1	1.7	34.0	38.6	23.6			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	15	12	1.0214	0.3852	0.2454	0.1000				

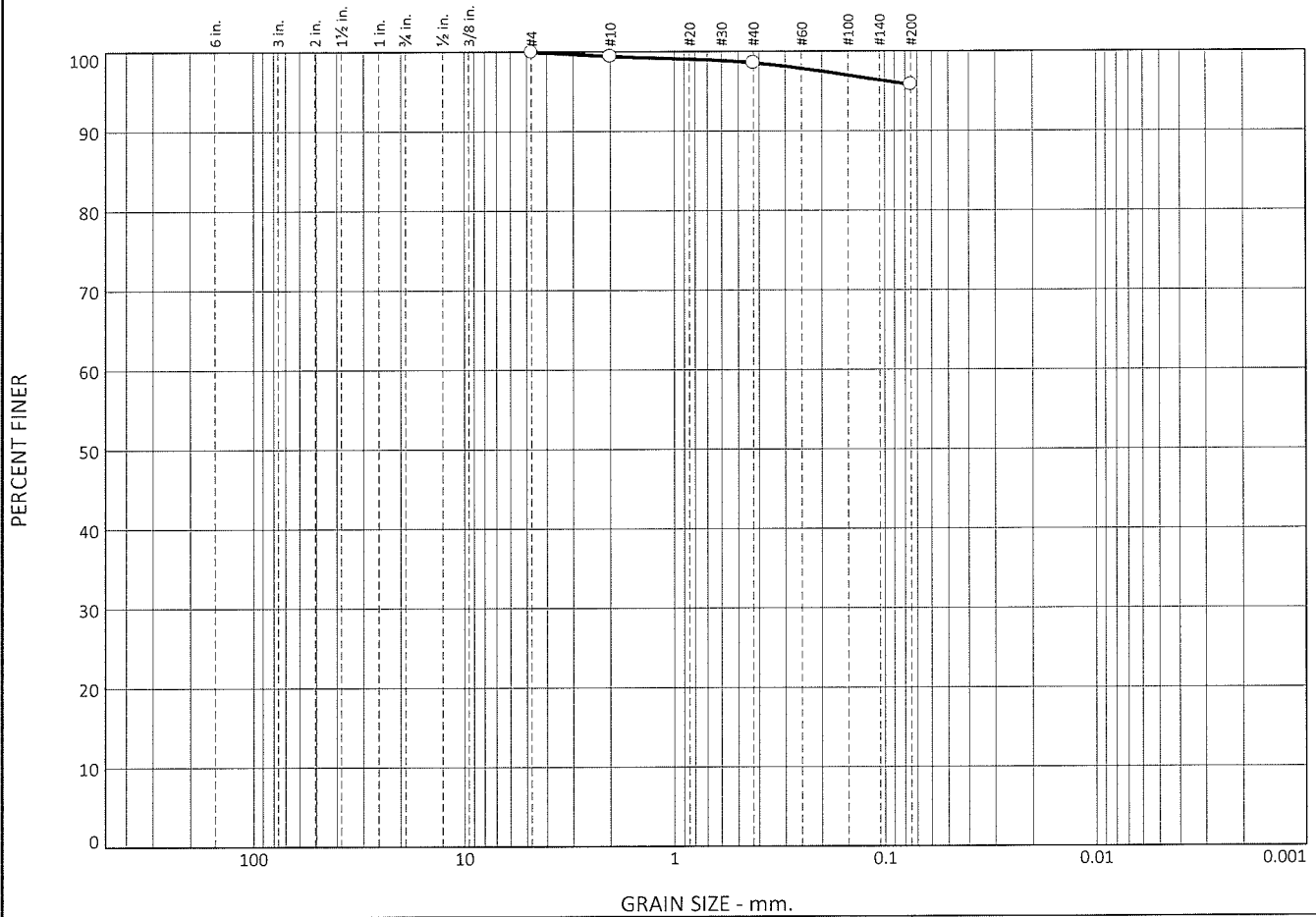
MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	08/29/24	SM	9.9

<p>Project No. 617654.0014 Client: DIGNEO ENGINEERING Project: CARLETON ES ADDITION GEOTECH DE #157-103 ○ Source of Sample: B-2 Depth: 4.0-6.0 FT Sample Number: S-3</p>	<p>Remarks: ○ SAMPLE DESCRIPTION BASED ON USCS</p>
<p>TRC Engineers, Inc. Mt. Laurel, NJ</p>	
<p>Figure 2</p>	

Tested By: OA 08/29/24

Checked By: JPB 08/30/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	0.0	0.6	0.8	2.8	95.8			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	66	21								

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BLACK/BROWN/GRAY FAT CLAY/ORGANIC CLAY	08/29/24	CH/OH	39.4

<p>Project No. 617654.0014 Client: DIGNEO ENGINEERING</p> <p>Project: CARLETON ES ADDITION GEOTECH</p> <p>DE #157-103</p> <p>○ Source of Sample: B-5 Depth: 13.0-15.0 FT Sample Number: S-6</p>	<p>Remarks:</p> <p>○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION</p>
<p>TRC Engineers, Inc.</p> <p>Mt. Laurel, NJ</p>	
<p>Figure 3</p>	

TRC ENGINEERS, INC.
ORGANIC CONTENT

Project Name: Carleton ES Addition Geotech DE #157-103
Client Name: Digneo Engineering
TRC Project #: 617654.0014

Organic Content	
Source #	B-5
Sample #	S-6
Depth (ft)	13.0-15.0
Oven-dried Test Specimen (Ovendried + Tare)	112.54
Mass of Ash (Ash + Tare):	109.52
Tare Weight:	60.75

Mass of Oven Dried Specimen (Soil only)	51.79
Mass of Ash:	48.77

Ash Content %:	94.17
----------------	-------

Organic Matter %	5.8
------------------	-----



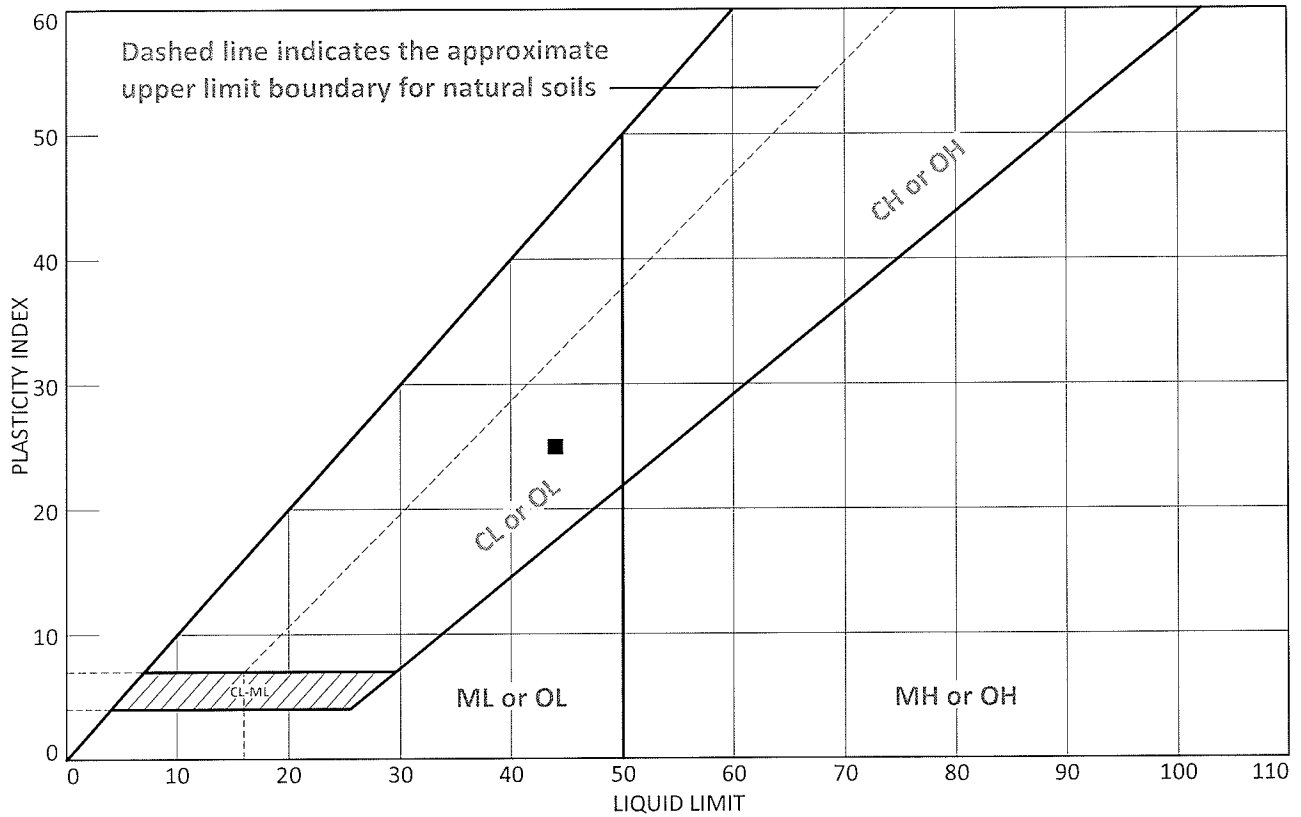
SUMMARY OF LABORATORY TEST DATA

Project Name: Carleton ES Additional Geotech
DE #157-103.1
 Client Name: Digneo Engineering
 TRC Project #: 617654.0022

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION USCS GRADATION				PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-101	S-3	4.0-6.0	SM	5.6	0.0	86.6	13.4	NP	NP	NP	-	
B-103	S-6	13.0-15.0	CL	32.6	0.0	13.0	87.0	44	19	25	0.5	

NP = NON-PLASTIC

Atterberg Limits and Moisture Content Report



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-101	S-3	4.0-6.0 FT	5.6	NP	NP	NP		SM
■	B-103	S-6	13.0-15.0 FT	32.6	19	44	25	0.5	CL

TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: DIGNEO ENGINEERING
Project: CARLETON ES ADDITIONAL GEOTECH
 DE #157-103.1
Project No.: 617654.0022

Figure 1

Particle Size Distribution Report



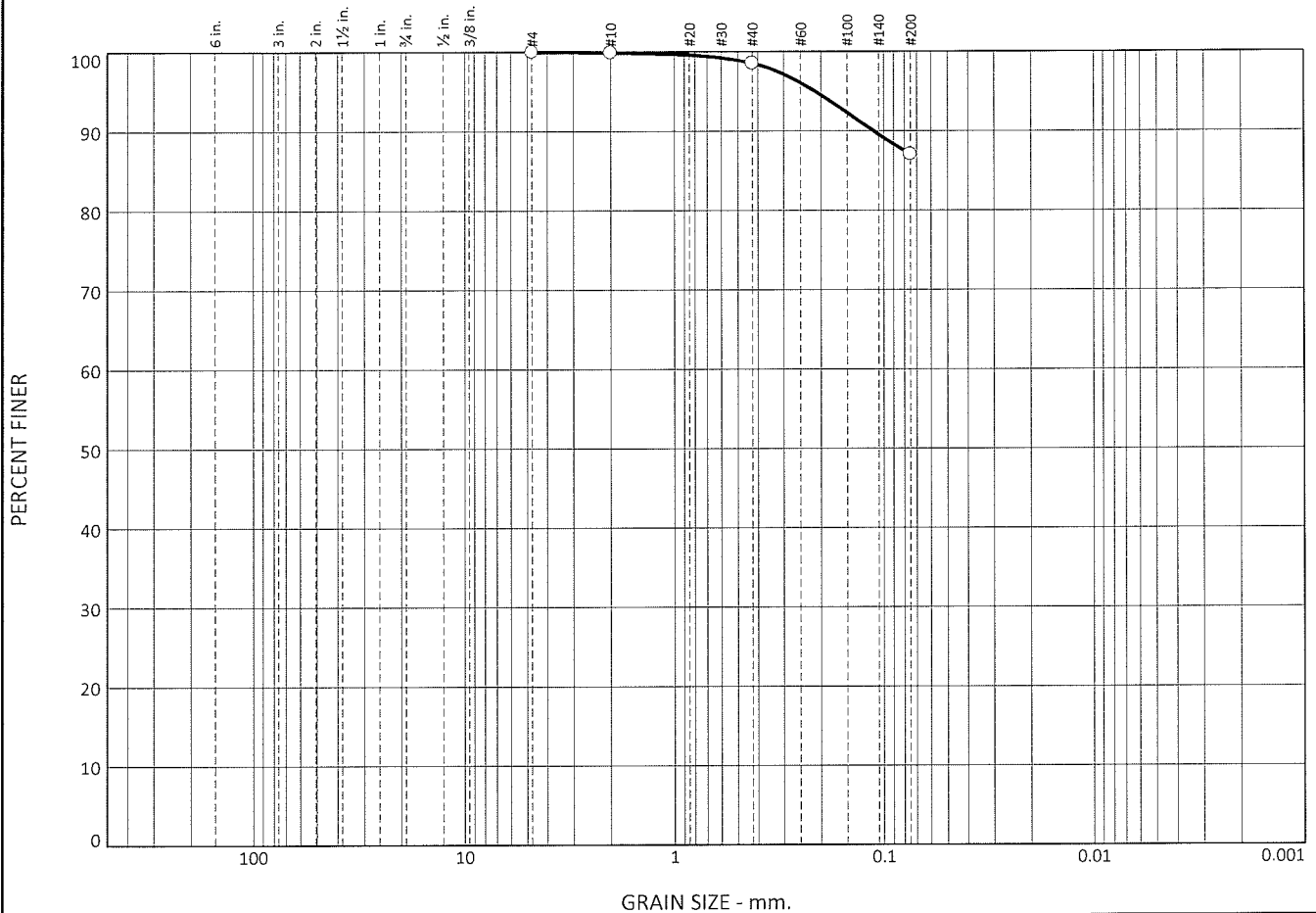
	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
<input type="radio"/>	0.0	0.0	0.0	0.1	16.7	69.8	13.4			
<input checked="" type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>	NP	NP	0.4565	0.2175	0.1725	0.1105	0.0780			

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
<input type="radio"/> BROWN SILTY SAND	10/23/24	SM	5.6

<p>Project No. 617654.0022 Client: DIGNEO ENGINEERING Project: CARLETON ES ADDITIONAL GEOTECH DE #157-103.1 <input type="radio"/> Source of Sample: B-101 Depth: 4.0-6.0 FT Sample Number: S-3</p> <p style="text-align: center;">TRC Engineers, Inc. Mt. Laurel, NJ</p>	<p>Remarks: <input type="radio"/> SAMPLE DESCRIPTION BASED ON USCS</p>
--	--

Tested By: JC 10/23/24 Checked By: JPB 10/24/24

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	0.0	0.1	1.3	11.6	87.0			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	44	19								

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY/BROWN LEAN CLAY	10/23/24	CL	32.6

<p>Project No. 617654.0022 Client: DIGNEO ENGINEERING Project: CARLETON ES ADDITIONAL GEOTECH DE #157-103.1 ○ Source of Sample: B-103 Depth: 13.0-15.0 FT Sample Number: S-6</p>	<p>Remarks: ○SAMPLE DESCRIPTION BASED ON USCS</p>
<p>TRC Engineers, Inc. Mt. Laurel, NJ</p>	<p>Figure 3</p>

Tested By: JC 10/23/24

Checked By: JPB 10/24/24

Attachment F
Private Utility Locating Field Sketch

TRINITY
Subsurface LLC

14 Hadco Road, Wilmington,
Delaware 19804

(855) 387-4648
www.trinitysubsurface.com

FIELD SKETCH
"Not to scale"

APWA® UNIFORM COLOR CODE

ELECTRIC
COMMUNICATIONS
GAS
WATER
STORM SEWER
SANITARY SEWER
UNKNOWN

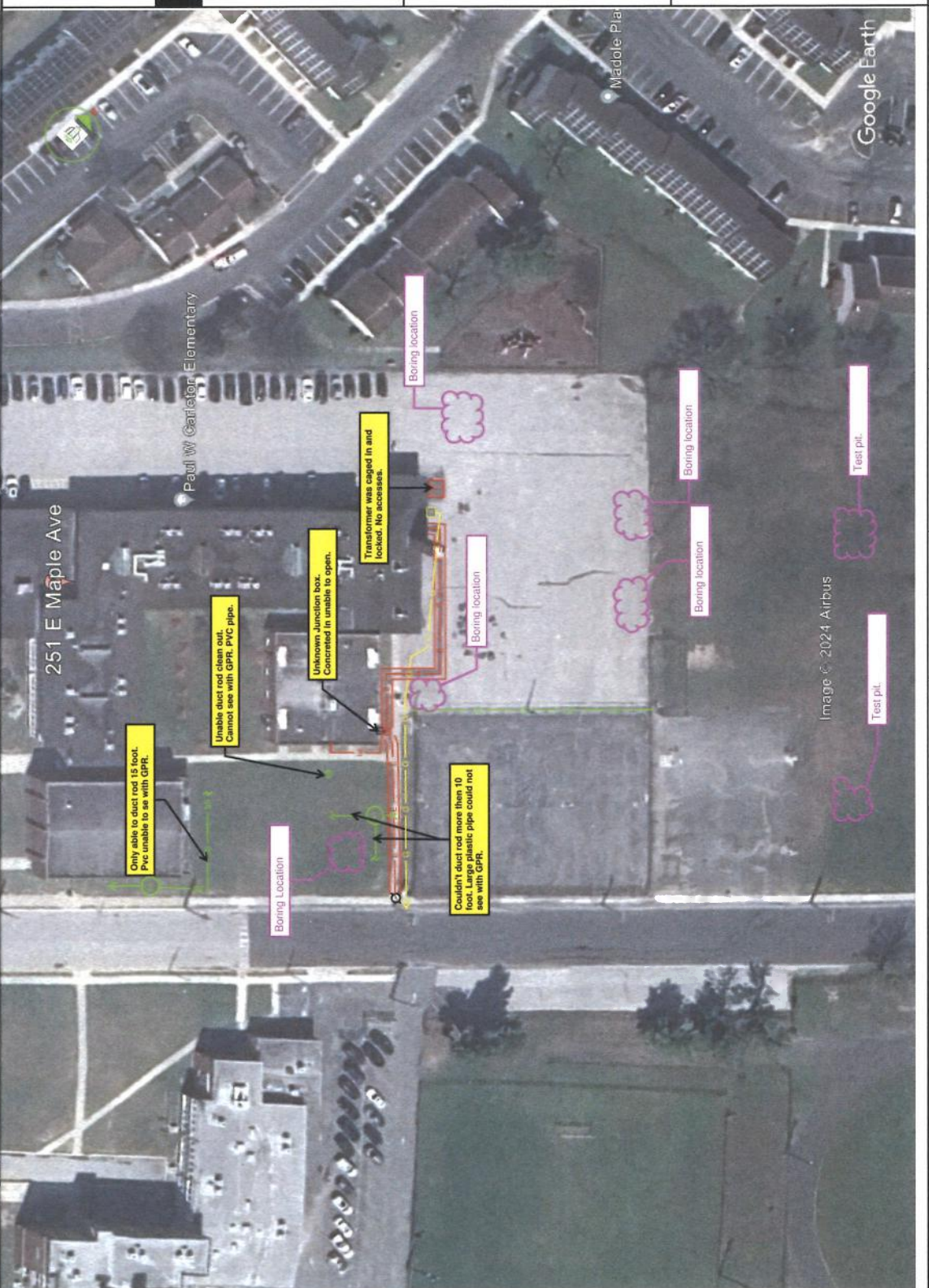
ASSUMED LINE LOCATION
(SEE CONTRACTOR COLOR CODE MANUAL FOR LINE TYPE)

SYMBOL LEGEND
(COLOR WILL CORRESPOND WITH UTILITY TYPE)

UTILITY POLE
MANHOLE
SITE LIGHT
TRANSFORMER
VALVE
IRRIGATION BOX
SQUARE INLET
ROUND INLET
ROOF DRAIN
POST INDICATOR VALVE

JUNCTION BOX
CLEANOUT
WATER VAULT
FIRE HYDRANT
GAS METER
CONTINUOUS LINE
END OF INFORMATION
BORING OR TEST HOLE LOCATION

FIELD NOTES



Paul W Carleton Elementary School - Pennsgrove NJ PROJECT NAME	24-17534.001 PROJECT NUMBER	08/19/2024 DATE	Joseph Sobieski DRAFTED BY	2 of 4 SHEET NUMBER
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SECTION 02000 – SITE WORK

DIVISION 2, EARTHWORK

SECTION 02 01 - CLEARING SITE

02 01 01 DESCRIPTION

Clearing site shall include all labor and equipment required for the work of clearing the site of the project, grubbing, removing structures, traffic control signs and other work as herein described, all in accordance with the Plans and Specifications.

02 01 02 MATERIALS

Paint, required for cuts on trees where branches have been removed, shall be an asphalt base paint, prepared for tree surgery and approved by the Engineer.

02 01 03 METHODS OF CONSTRUCTION

Within the limits of the site of the Project and outside thereof within slope areas to be graded, or as otherwise prescribed, the ground surface shall be cleared of trees, brush, weeds, roots, matted leaves, structures, traffic control devices debris and other unsuitable matter before construction work is commenced, except that trees which do not interfere with the Project, in the opinion of the Engineer, shall not be removed but shall be protected during the progress of the work. Tree stumps shall be grubbed out for all trees removed.

Material accumulated by clearing, grubbing, removal of structures and cleaning out as above described shall be disposed of by the Contractor in a manner satisfactory to the Engineer and in conformance with Federal, State and local regulations.

SECTION 02 02 - SOIL EROSION CONTROL

02 02 01 DESCRIPTION

Soil Erosion Control shall include the installation and maintenance of inlet sediment control devices, silt fencing, construction entrances or any other devices as required by the County Soil Conservation District and the carrying out of such other soil erosion control measures as may be described elsewhere herein, or shown on the Plans. The Contractor is responsible for complying with Applicable Soil Erosion Control measures for this project.

All soil erosion and sediment control facilities shall be constructed in conformance with the New Jersey Standards therefore.

02 02 02 CONSTRUCTION SEQUENCE

For purposes of soil erosion control, the Contractor shall adhere to the following construction sequence:

1. Install inlet sediment control devices on existing inlets before disturbing any ground or pavements on the site.
2. Install silt fence adjacent to construction area in the locations shown on the plans or as directed by engineer.

SECTION 02000 – SITE WORK

3. Complete underground utilities reconstruction with as little disruption of paved and stable surfaces as possible. Add sediment control devices to new inlets as they are built. Construct temporary cold patch pavements when and as required in other Sections of these Specifications.
4. Reconstruct curbs, sidewalks and drive aprons.
5. Stabilize earth areas with sod or other prescribed ground cover.
6. Roadway excavation and repaving. No disturbed soil shall be exposed for a period longer than ten (10) calendar days.
7. Remove inlet sediment control facilities as the ground draining to each inlet is stabilized.
8. Clean all storm drains of silt and debris.
9. Operations 3, 4, 5 and 6 above, may be in a different sequence from that shown.

02 02 03 INLET SEDIMENT CONTROL

Inlet sediment control devices shall be constructed in accordance with the details in the Plans and shall be placed where indicated in the Plans. They shall be securely fastened in place and shall be maintained in good working order by the Contractor as long as they are needed.

A sediment control device no longer needed at one location may be reset at another, provided that it is in good condition and functions properly. All sediment control facilities shall be ultimately removed from the Project site, by the Contractor.

02 02 04 ROADWAY CLEANING

The roads are to be kept clean and dust free. All streets are to be swept daily with a power broom with a water tank or with a water wagon.

02 02 05 CONSTRUCTION ACCESS/ENTRANCE

Contractor shall install a construction entrance at a minimum 18' wide for 50' in length utilizing ASTM No.1 1.5"-3.5" stone 12" thick on top of geotextile separation fabric. Where soil is soft, the contractor shall utilize geogrid. The material shall be model TX190L or NXL as Manufactured by Tensar or approved equal. Contractor shall be required to provide all necessary stabilization of the site for construction of all improvements shown and any laydown/staging Areas. Contractor shall be required to maintain and repair the construction entrance throughout the course of the project.

SECTION 02 03 - ON-SITE EXCAVATION

02 03 01 DESCRIPTION

On-site excavation shall include the demolition, excavation, over excavation and removal of all on-site materials as required for construction of the Project. On-site excavation shall also include the transportation of excavated materials, the disposal of excavated materials, and other work as herein specified.

On-site excavation shall be unclassified and shall include the excavation and removal of all earth,

SECTION 02000 – SITE WORK

rock, boulders, concrete, masonry, small structures, sidewalks, drive aprons, paving, tree roots and other materials which require removal prior to construction of improvements, topsoil stripping, and all other materials encountered, of whatever nature.

02 03 02 METHOD OF CONSTRUCTION

Under proposed paved areas, including roadways, sidewalks, curbs, drive aprons and driveways, topsoil will be stripped completely. Complete topsoil stripping will also be required under and within ten feet (10') of proposed buildings or other structures. Complete topsoil stripping is defined as removal of all topsoil regardless of depth.

Excavation shall be carried to the lines, grades and slopes indicated in the Plans. Where the cellar walls or foundations lie within paved areas, dedicated street rights-of-way, utility rights-of-way, or building areas, the structure shall be completely removed.

When indicated on the Plans, existing concrete slabs and/or asphalt paving shall be saw-cut at the limits of work. This shall be a full depth saw-cut, the purpose of which is to prevent damage to the existing structures and surfaces to remain, and to provide a neat, straight joint between the new and existing construction.

All pavements to be excavated shall be cut with a sharp tool to form neat vertical edges. If a neat straight line satisfactory to the Engineer cannot be achieved by other means at a pavement joint that will be exposed, the Contractor shall saw cut the pavement at that location.

Excavation shall be carried out in such a manner that the site is kept properly drained at all times.

Tree roots of trees to remain, shall be removed a minimum of four (4) inches clear of the subgrade. All roots larger than one (1) inch in diameter shall be cut with a saw and treated with an approved tree wound compound.

The contractor shall exercise extreme care when working near existing trees that are to remain. Any damage shall be promptly repaired by cutting, cleaning and treating as directed by the Engineer. Any tree severely damaged in the opinion of the Engineer shall be removed and replaced. This work shall be done at the Contractor's own expense.

02 03 03 DISPOSAL OF MATERIALS

Except for the specific exceptions listed below, all excavated materials shall become the property of the Contractor, and he shall be responsible for their transportation and disposal. Disposal shall take place at sites provided by the Contractor which are licensed by N.J.D.E.P. to accept the particular material(s).

During construction topsoil, other soils and soil aggregates shall be hauled and stockpiled by the Contractor at locations designated by the Owner or their representative on-site. Surplus topsoil shall be kept segregated during construction. All Surplus soils and soil aggregates not used as part of the project shall become property of the Contractor and shall be hauled and disposed of at their own expense.

Castings, valves, fire hydrants, and similar items which are removed shall, at the Engineer's discretion, remain the property of the Owner. The Contractor shall haul and stockpile the selected items at locations designated by the Owner. Those items not wanted by the Owner shall become the property of the Contractor, and he shall be responsible for their transportation and disposal as described above.

SECTION 02000 – SITE WORK

Pavements over which excavated materials are transported shall be maintained clean of such materials at all times.

SECTION 02 04 – BORROW EXCAVATION

02 04 01 DESCRIPTION

Borrow Excavation shall include the furnishing, transporting, placing and compacting of materials required for embankments or backfills in excess of those obtained from on-site excavation and other excavation and incidental work within the Project site. Undercut and Subgrade Material shall include the excavation and disposal of deleterious material as well as refill with Subgrade Material.

02 04 02 MATERIALS

Borrow material shall be a clean, well graded granular material suitable for embankment; shall be in conformance with NJDOT gradation designation I-8; and shall be approved by the Engineer. The Contractor shall provide the Engineer with a certified sieve analysis of the materials he proposes to use prior to transporting any material to the Project site. The materials shall be taken from sources furnished by the Contractor. All topsoil, brush, sod, weeds and other unsuitable materials shall be removed.

Undercut and Subgrade Material shall be 3/4" clean stone or approved equal.

02 04 03 METHODS OF CONSTRUCTION

Pavements over which Borrow materials are transported shall be maintained clean of such material at all times.

Placement of material for Borrow Excavation or Undercut and Subgrade Material shall be made in layers not exceeding six inches (6") compacted thickness. Each lift shall be compacted in accordance with Section 02 05 of the Specification prior to constructing the subsequent lift.

SECTION 02 05 - COMPACTION

02 05 01 GENERAL REQUIREMENTS

All soils and soil aggregate courses (except topsoil) shall be compacted to at least 95% of their Maximum Density at a moisture content within 2% of optimum as defined and determined by current A.S.T.M. Designation D-698, Method C.

Included in the areas to be so compacted are:

- All surfaces on which embankments or roadways are to be constructed.
- Each layer of embankment.
- The bottoms of all subsurface structure excavations.
- Each layer of ALL backfills, including trenches.
- All subgrades, including those for sidewalks, curbs, drive aprons, and areas to be planted.
- All dense graded aggregate base and subbase courses.

02 05 02 STRUCTURAL REQUIREMENTS

SECTION 02000 – SITE WORK

The Contractor shall supply and install all sand and/or gravel required for fill or as detailed on the Plans or as required to achieve the compaction requirements herein. Deposit such clean fill (free of all debris, rubble, building materials, etc.) in eight (8") inch layers and thoroughly dampen and compact to tight compaction prior to depositing each succeeding 8" layer. Calculation of fill quantities required for select borrow excavation/structural fill shall be the Contractor's responsibility.

Compaction of select borrow excavation/structural fill as noted above shall be done with clean, well graded sand and gravel. The compaction shall be tested, at the Contractor's expense, and shall provide at least 95% of maximum standard dry density according to AASHTO T99-62 (ASTM D698-ggt). No fill materials shall be placed, spread or rolled while ground or fill is frozen, thawing or excessively wet, or during periods of precipitation. Following precipitation interruptions of fill work, fill operations shall not be resumed until the moisture content and density of all materials are approved by the Engineer. Corrective action will be required where the Engineer's/Geotechnical inspection (or tests required of the Contractor by the Owners Representative) show compaction results are less than those specified. All required corrections shall be the responsibility of the Contractor.

Where the Geotechnical Inspections show compaction results are less than those specified, and the contractor has completed all the compaction remedies referenced within the geotechnical report the contractor will be required to over-excavate the found areas to the depth and extents as determined in the field by the Geotechnical Engineer. It shall consist of the removal and disposal of the unsuitable subgrade following excavation from the demolition and compaction remedies and fill with suitable replacement material as defined in division 9 and the geotechnical report. It is the intent to remove and replace any identified soft areas within the proposed areas of improvements and shall be performed on an "If and Where Basis" as directed by the Geotechnical Engineer.

02 05 03 COMPACTION METHODS AND EQUIPMENT

The Contractor may use whatever methods and equipment he deems best to achieve the required compaction, provided however, that he shall not use any methods or equipment that might cause damage to any above or below ground structures or utilities, either in or adjacent to the Project.

The Contractor shall be responsible for providing, at no additional cost to the Owner, an independent testing laboratory on-site and prior to operations to validate and verify the compaction through testing of the material prior to placement and field verification via density testing. Reports shall be furnished to the Engineer indicating test location and results for each test.

No soils or soil aggregate courses shall be built upon in any manner until they have been compacted to the required density. Any surface or course which is subsequently disturbed in any way that could lessen its density shall be recompacted before proceeding with any construction thereon.

The Contractor shall moisten materials being compacted when and as necessary to achieve optimum moisture content requirements.

SECTION 02 06 - SUBSURFACE STRUCTURE EXCAVATION

02 06 01 DESCRIPTION

Subsurface structure excavation shall include all the labor and equipment for excavation and backfill for drains, drain pipes, culverts, sewers, water pipes, conduits, manholes, foundations, inlets and similar structures at the required locations, to the prescribed lines and elevations and in accordance with the Plans and Specifications.

02 06 02 MATERIALS

SECTION 02000 – SITE WORK

Materials imported shall be a clean, well graded granular material suitable for embankment; shall have a maximum 25% by weight of materials passing a number 200 sieve; shall be in conformance with NJDOT gradation designation I-10 and shall be approved by the Engineer. The Contractor shall provide the Engineer with a certified sieve analysis of the materials he proposes to use prior to transporting any material to the Project site. The materials shall be taken from sources furnished by the Contractor. All topsoil, brush, sod, weeds and other unsuitable materials shall be removed.

02 06 03 METHODS OF CONSTRUCTION

The Contractor shall do all excavation of whatever substances encountered to the limits indicated in the Plans.

Excavation shall not be carried below the prescribed elevations for the foundations of pipes and structures, except where unstable soil is encountered. Where unstable soil is found, the Engineer will indicate to the Contractor the extent of Undercut and Borrow Excavation to be performed in conformance with Section 02 04 of the Specification.

Pipe trenches and pipe bedding shall conform to the details in the Plans. Excavations for manholes and other structures shall have twelve-inch minimum clearance on all sides and have the same compacted bedding as shown for pipe. Rocks and boulders in excavations shall be removed within six inches of all pipe structures.

Before laying pipe, the Contractor shall ascertain the locations and elevations of other pipes and subsurface structures that might interfere with the proposed construction and he shall make exploratory excavations when and where necessary to obtain such information.

Pipe trenches shall not be opened further in advance of laying pipe than the length of pipe the Contractor can reasonably expect to lay in one day.

The Contractor shall do all bracing, shoring and sheathing necessary to prevent failure of the banks of excavations and to protect the work, workmen, public, under and above ground utilities and structures, pavements, and public and private property. No bracing, shoring, or sheeting shall be placed below the bottom of the pipe or structure unless approved by the Engineer. All bracing, sheathing and shoring shall be withdrawn one 6" layer at a time as backfilling proceeds.

Ground adjacent to the excavations shall be graded to prevent water from running in. The Contractor shall remove any water accumulating in excavations by pumping or other means approved by the Engineer.

The Contractor shall provide, install and operate an adequate system of dewatering devices when necessary to stabilize trench bottoms and banks or other excavations, or when necessary to protect the work, workmen, public, under and above ground utilities and structures, pavements, or public and private property. The system shall be removed by the Contractor upon completion of backfill, and the holes remaining shall be backfilled and tightly compacted. It is the Bidder's obligation to ascertain by his own investigation when and where dewatering is likely to be needed for the proper execution of the work.

The discharges from all dewatering pumps shall be conducted to storm drains or natural drainage channels in a manner that will not cause damage to any surface, structure or work.

After the structure has been completed, inspected and approved, or, in the case of pipe, after each joint has been made, inspected and approved backfilling shall proceed immediately. The entire backfill, from

SECTION 02000 – SITE WORK

the bottom of the excavation to proposed finished subgrade, shall be placed in layers of not more than six inches compacted thickness, and each layer shall be compacted as specified in Section 02 05 of the Specification. Puddling of backfills will not be permitted.

Soils which are determined by the Engineer to be suitable for use as borrow material shall be stockpiled on the project site for that use. Stockpiles shall be kept neat in appearance and stabilized with rye grass or other methods approved by the Engineer.

All surplus soils and excavated materials which are not suitable for embankment shall be disposed of by the Contractor in accordance with applicable rules and regulations at no cost to the owner unless otherwise provided for in the specifications.

On trees that are to remain, all roots 1/2 inch in diameter and larger which are damaged by the Contractor shall be cut and treated with an approved tree wound compound. The Contractor shall exercise extreme care when working near existing trees that are to remain. Any damage shall be promptly repaired by cutting, cleaning and treating as directed by the Engineer. Any tree severely damaged in the opinion of the Engineer shall be removed and replaced. This work shall be done at the Contractor's own expense.

SECTION 02 07 - DEWATERING

02 07 01 DESCRIPTION

The Contractor shall furnish all labor, material, and equipment necessary to plan, obtain approval for, provide for, implement, maintain and guarantee an adequate system of dewatering as required to keep all excavations free of groundwater and stormwater in order to perform work of the contract and protect the work, workmen, public, under and above ground utilities and structures, pavements, building pads, foundations and public and private property. All permits are the responsibility of the Contractor.

02 07 02 RELATED SECTIONS

Section 02 01 – Clearing Site
Section 02 02 – Soil Erosion Control
Section 02-03 – On-Site Excavation
Section 02 04 – Compaction
Section 03 02 – Dense Graded Aggregate Subbase
Section 05 02 – Storm Drains
Section 09 01 – Structural Earthwork
Section 09 02 – Structural Concrete

02 07 03 DEWATERING METHODS AND EQUIPMENT

The Contractor may use whatever methods and equipment he deems best to achieve the required dewatering, provided however, that he shall not use any methods or equipment that might cause damage to above or below ground structures or utilities, either in or adjacent to the project. The Contractor shall maintain on site backup pumps or other components as necessary to provide for continuous and uninterrupted dewatering during the project.

All components of the dewatering system or portion thereof shall be removed by the Contractor upon the completion of backfill, and any holes remaining from the system shall be backfilled and thoroughly compacted to the satisfaction of the Engineer. All permits are the responsibility of the Contractor.

SECTION 02000 – SITE WORK

SECTION 02 08 – SITE GRADING

02 08 01 DESCRIPTION

This section includes all the labor and necessary equipment for preparing sub-grades for slabs-on-grade, walks, pavements, lawns, and plantings and shall reference Section 02 03 for achieving the prescribed grades and elevations. Shall include rough and finish grading. Contractor may also refer to Section 07 01 for topsoil placement and finish grading.

The contractor is to minimally firm the soil to the consistency needed to place equipment on the surface, with no tracking or depressions from equipment with turf type tires, to complete the project. This shall mean no more than 75-80% of maximum using ASTM D1557.

02 08 02 MATERIALS

Materials being graded shall be suitable therefore and shall be free from stumps, wood, brush, sod, rubbish, garbage and other matter that may decay. The primary materials shall be those available from work within the Project Site. No such materials are to be wasted or otherwise disposed of by the Contractor. When additional material is needed, it shall be obtained from approved Borrow Excavation, Topsoil stock pile, Modified/Imported or Topsoil and Seed, at no additional cost to the Owner.

02 08 03 METHODS OF CONSTRUCTION

Site grading shall have uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

The Contractor shall provide a smooth transition between adjacent existing grades and new grades.

Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

Slope grades to direct water away from buildings, provide positive drainage in accordance with the plans and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus, or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

Grading inside Building Lines: Finish sub-grade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

Finish Grading shall be performed in conjunction with the spreading of the topsoil at the prescribed locations, to the prescribed lines and grades, and in accordance with the plans and specifications. Where applicable, the Contractor shall reuse the stripped topsoil on the areas it is stripped from.

Finish grading should be performed to bring all areas to the prescribed finished elevation per the plans. All grades shall be approved by the Engineer before proceeding.

Contractor shall protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

SECTION 02000 – SITE WORK

Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

Where settling occurs before project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

DIVISION 3, PAVEMENTS

SECTION 03 01 - MILLING & RECYCLING OF PAVEMENT

03 01 01 DESCRIPTION

Milling and Recycling of Pavement shall include all the labor and equipment necessary for removal of bituminous concrete and subbase to the depth specified or shown on the Plans, compaction of subbase as per Section 02 05 of this Specification and grading to the profile and cross slope as shown on the Plans or directed by the Engineer.

The Contractor shall mill out and recycle the existing bituminous pavement. The existing pavement depth may vary. Millings are to be reused on the site for supplementing the existing subbase to the proposed grades and for repairs to the subbase, if required. Millings in excess of those used on the project are to become the property of the Contractor and are to be removed from the site and taken to an appropriate recycling facility. The Contractor shall provide to the Engineer certification of the gross tonnage of material milled and recycled.

The Contractor shall be responsible for the excavation, transport, placement, grading, and compaction of the existing pavement. The Contractor is directed to Division 02 of this specification for additional requirements. Unless otherwise provided for in the Proposal the cost of all earthwork shall be included in the price for this item. The removed pavement shall be transported to and deposited at an approved facility by the Contractor.

This item includes the restoration of all previously grassed disturbed areas with 6" thick topsoil, seed, & fertilizer

03 01 02 EQUIPMENT

The milling machine shall be a self-propelled planning, grinding or cutting machine with variable operating speeds, capable of removing bituminous concrete without the use of heat to the depth, profile and cross slope shown on the Plans.

The milling machine shall be equipped with automatic grade controls. The reference system may be either string line or ski type. Use of the automatic grade controls will be required except at intersections and other locations where its use is not practical.

The milling operation, including removal of the milled material, shall be carried out in a manner that will prevent dust and other particulate matter from escaping into the air.

Teeth in the milling drum that become dislodged, broken or unevenly worn shall be replaced immediately with teeth that are of the same length as the remaining teeth in that row.

If the milled material is to be recycled, the milling equipment, where practical, shall be operated in such a manner as to produce milled material of which 95 percent will pass a 2-1/2 inch sieve. The roadway surface shall be cleared of all debris and power broomed to remove fine particles prior to milling. On shoulders before brooming, any earth berm shall be removed as necessary to expose the full width of the roadway and prevent silt and grass from contaminating the milled material.

03 01 03 EQUIPMENT & METHOD OF CONSTRUCTION

Milling shall start at the low side of the cross section and progress toward the high side. Provisions shall be made for removal of any water that may be trapped due to the milling operation, such as by lateral saw cuts to provide adjacent overlay relief. In the event that all milled areas which are opened to traffic have

SECTION 02000 – SITE WORK

not been milled to a flush surface by the end of the workday the longitudinal edges of the milled area, exceeding 1 1/2 inches high, shall be sloped and a smooth transition shall be provided at the transverse edges.

Areas to be milled not accessible to the milling machine shall be removed by other equipment.

Bituminous Concrete below the specified level of milling that becomes dislodged or delaminated shall be removed at no cost to the Owner and replaced with bituminous concrete conforming to these Specifications.

The surface of the milled area shall be swept clean prior to being opened to traffic and prior to the following construction or resurfacing stage. Millings shall be removed from the curb, sidewalk and park strip.

The roadway surface that will be opened to traffic before resurfacing shall be free from gouges, continuous grooves, ridges and delaminated areas and shall have a uniformly textured appearance consisting of discontinuous longitudinal striations which shall not deviate more than 1 inch in 200 feet from a line parallel to the center of the roadway and not to exceed 0.375 inch depth and which shall provide a skid resistance not less than that of the original surface prior to milling and shall permit passage of highway traffic at the posted speed limit without vehicle operators experiencing impaired directional control.

The depth of the completed milling from the original surface to the top of the high spots of the textured surface shall be as shown on the Plans while producing a smooth profile and cross section.

SECTION 03 02 - DENSE GRADED AGGREGATE SUBBASE

03 02 01 DESCRIPTION

Dense Graded Aggregate Subbase shall include the purchase, placement and all labor and equipment required for the preparation of subgrade for and the construction of subbase at the prescribed locations and as directed by the Engineer, to the prescribed lines, grades and dimensions, and in accordance with the Plans and Specifications.

DGA, 6" Thick shall be constructed if and where directed by the Engineer or as indicated on the details of the Construction Plan set. The total quantity of DGA required is shown as 6" thick and will be installed under the Asphalt in areas indicated on the Construction Plan set.

DGA, 4" Thick shall be constructed under all concrete flatwork at the locations indicated on the construction plans.

03 02 02 MATERIALS

The material for the subbase shall be Dense Graded Aggregate Base Course, conforming to the current N.J.D.O.T. specifications, except the requirements for moisture content immediately prior to placement. Recycled concrete will not be permitted. Before any material is delivered to the project site, the Contractor shall furnish the Engineer with a certification attesting that the material he proposes to use has been tested and does conform to all N.J.D.O.T. requirements for Dense Graded Aggregate Base Course. Only approved material shall be furnished and placed, and only one type of material - i.e., either quarry-processed stone, or blast furnace slag, or crushed gravel - shall be used throughout the Project.

03 02 03 METHODS OF CONSTRUCTION

For all dense graded aggregate subbase, the subgrade shall be properly shaped to the prescribed elevations and contours, and compacted as specified in Section 2.5, before the new course is laid.

SECTION 02000 – SITE WORK

The dense graded aggregate shall be spread in a uniform layer (or layers) to obtain the full depth of the specified thickness, when compacted. The material shall be compacted as specified in Section 02 05.

The surface of the finished new subbase shall be smooth and free of defects, and it shall be true to the required grades and contours.

SECTION 03 03 - BITUMINOUS STABILIZED BASE COURSE (Hot Mix Asphalt HMA 19M64)

03 03 01 DESCRIPTION

Bituminous Stabilized Base Course shall include purchase and the construction of hot-mixed bituminous concrete base course, on approved foundations, at the prescribed locations, and to the prescribed lines, grades and thicknesses per the construction plans. Removed pavements as well as other excavated materials shall be transported and legally disposed of by the Contractor. Pavement Excavation and Grading as necessary to achieve design grades shall be included as part of this item.

03 03 02 MATERIALS AND METHODS OF CONSTRUCTION

All materials and methods of construction for Bituminous Stabilized Base Course shall conform to the following requirements:

All paving operations are to be performed during normal business hours.

Bituminous Stabilized Base Course shall be, 19M64. No carbonate rock shall be used in the mix design. No recycled concrete shall be permitted.

HMA 19M64 Base Course shall be constructed in accordance with the requirements of Section 404 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation modified and amended as follows.

The proposed full depth paving, asphalt path paving and/or overlay shall be constructed at the thickness indicated on the plans/specs.

The Contractor shall be responsible for setting all manhole castings, water valve boxes, curb stops, cleanouts, inlet heads and all other structures and miscellaneous castings to the proper finished grades prior to placing the new surfaces. Unless provided otherwise in the Proposal, the cost thereof shall be included in the prices bid for the bituminous paving items.

The Contractor shall submit the job mix formula for the bituminous concrete mixture to the Engineer for approval, before ordering such materials, and he shall provide the Engineer with certifications from the bituminous concrete producer that the materials delivered to the Project conform to the approved job mix formulas.

All bituminous concrete base course shall be constructed to the respective compacted thickness specified.

Soil subbase courses shall be given a prime coat before bituminous-stabilized base course is laid. Each underlying pavement course shall be swept clean and given a tack coat before the next pavement course is laid thereon. The vertical contact surfaces of pavement edges, manholes and other structures shall be painted with a thin uniform coating of tack coat material just prior to placing bituminous concrete against them.

Bituminous concrete pavers with automatic grade and slope controls may be used but will not be required.

SECTION 02000 – SITE WORK

03 03 03 SAMPLING AND TESTING

Testing for conformance with the job mix formula shall be performed by taking extractions at the plant. The testing of the extractions shall be performed by an independent laboratory or at the plant laboratory and witnessed by the Engineer's representative. The samples will be taken at the plant from the loaded trucks and the tests will be performed or witnessed by an independent testing laboratory chosen by the Owner. Approximately one sample will be taken for every 600 tons of material.

The Owner may have drilled cores taken from finished bituminous concrete pavement and base courses and have them tested for conformance as specified in the above specification. When samples are taken, all surface and/or base courses disturbed by the sampling shall be restored at the expense of the Contractor. The paving Contractor shall be required to repair the core holes drilled by the testing laboratory with hot mix material and painted with hot asphalt cement. The paving Contractor shall arrange to be at the site at the same time the testing laboratory is drilling the cores. If the paving Contractor cannot arrange this, then he will be responsible for removing the patch installed by the testing company prior to installing the hot mix. No additional payment will be made for the patching of the cores. The cost of patching should be included in the cost of the various Bituminous Concrete Courses in the Proposal.

All sampling and testing will be done by an independent testing laboratory chosen by the Owner. The cost of the laboratory will be paid for by the Owner.

Cores may be taken at random locations selected by the Engineer throughout the Project.

The Engineer may order the removal of any material represented by core samples that does not meet the requirements of every characteristic as outlined in the specifications. The removal of such unsatisfactory material, repaving with acceptable material, and additional sampling and testing as deemed necessary by the Engineer, shall all be at the expense of the Contractor.

03 03 04 SURFACE REQUIREMENTS

In addition to other surface requirements, if the bituminous concrete base course will be used as a finished surface course, even temporarily, its acceptance will be based upon the extent to which the finished surface retains water. The Contractor shall repair any and all pavement areas which in the opinion of the Engineer are ponding water. The Engineer's evaluation of ponded areas will be made approximately one hour after a rainfall has ceased.

Repairs shall be made by full depth replacement of the course, utilizing the same type of material. All methods of repair shall conform to the recommended procedures of the Asphalt Institute. All pavement cutting shall be accomplished with an approved asphalt saw. Jackhammer cutting will not be permitted.

SECTION 03 04 - BITUMINOUS CONCRETE SURFACE COURSE (Hot Mix Asphalt –HMA 9.5M64)

03 04 01 DESCRIPTION

Bituminous Concrete Surface Course shall include the construction of hot-mixed bituminous concrete surface on approved foundations, at the prescribed locations, and to the prescribed lines, grades and thicknesses per the construction plans. Removed pavements as well as other excavated materials shall be transported and legally disposed of by the Contractor. Any grassed area disturbed through the installation of pathway shall be replaced with topsoil, seed, and fertilizer.

03 04 02 MATERIALS AND METHODS OF CONSTRUCTION

All materials and methods of construction for Bituminous Concrete Surface Course shall conform to the following requirements:

SECTION 02000 – SITE WORK

All paving operations are to be performed during normal business hours.

The Contractor shall be responsible for setting all manhole castings, water valve boxes, curb stops, cleanouts, inlet heads and all other structures and miscellaneous castings to the proper finished grades prior to placing the new surfaces.

The proposed full depth paving, asphalt path paving and/or overlay shall be constructed at the thickness indicated on the plans/specs.

Bituminous Concrete Surface Course shall be HMA 9.5M64. No carbonate rock shall be used in the mix design. No recycled concrete shall be permitted.

HMA 9.5M64 Surface Course shall be constructed in accordance with the requirements of Section 404 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation modified and amended as follows.

The Contractor shall submit the job mix formula to the Engineer for approval for each bituminous concrete mixture and a certification from the producer that the job mix formula has been approved by the New Jersey Department of Transportation, before ordering such materials. The Contractor shall also provide the Engineer with certifications from the bituminous concrete producer that the materials delivered to the Project conform to the approved job mix formulas.

Before laying bituminous concrete surface course, the contact surfaces of all pavement edges, curbs, inlets, manholes, and other structures shall be painted with a thin uniform coating of asphaltic oil, Grade RC-250.

Bituminous concrete pavers with automatic grade and slope controls may be used but will not be required.

The Contractor shall rake out large pieces of aggregate in feathered areas, as necessary, to provide a smooth surface.

All bituminous concrete surface shall be constructed to the respective compacted thickness specified and as shown on the plans from edge to edge along the cartway. The Contractor shall rake out large pieces of aggregate in feathered areas, as necessary, to provide a smooth surface.

All existing paved surfaces on which bituminous concrete are to be laid shall be broom swept clean and given a tack coat prior to paving. The vertical contact surfaces of pavement edges, manholes and other structures shall be painted with a thin uniform coating of tack coat material just prior to placing bituminous concrete against them.

Pavement joints, curb lines, inlets, manholes and other structures in the paving shall be sealed with a hot-poured joint sealing compound.

Butt joints shall be constructed wherever an end or an edge of an overlay is located in an existing paved roadway surface. Finished butt joints shall be sealed with a hot-poured joint sealing compound.

The Raising of Manhole and Inlet Castings shall conform to the requirements for resetting castings in Section 603 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, except that the use of extension frames will not be permitted. If a manhole casting or lid needs to be replaced, the lid and casting will be supplied by the contractor and the cost of replacement shall be included in the cost of the pavement.

03 04 03 SAMPLING AND TESTING

Testing for conformance with the job mix formula shall be performed by taking extractions at the

SECTION 02000 – SITE WORK

plant. The testing of the extractions shall be performed by an independent laboratory or at the plant laboratory and witnessed by the Engineer's representative. The samples will be taken at the plant from the loaded trucks and the tests will be performed or witnessed by an independent testing laboratory chosen by the Owner. Approximately one sample will be taken for every 600 tons of material.

The Owner may have drilled cores taken from finished bituminous concrete pavement and base courses and have them tested for conformance as specified in the above specification. When samples are taken, all surface and/or base courses disturbed by the sampling shall be restored at the expense of the Contractor. The paving Contractor shall be required to repair the core holes drilled by the testing laboratory with hot mix material and painted with hot asphalt cement. The paving Contractor shall arrange to be at the site at the same time the testing laboratory is drilling the cores. If the paving Contractor cannot arrange this, then he will be responsible for removing the patch installed by the testing company prior to installing the hot mix. No additional payment will be made for the patching of the cores. The cost of patching should be included in the cost of the Bituminous Concrete Surface Course in the Proposal.

All sampling and testing will be done by an independent testing laboratory chosen by the Owner. The cost of the laboratory will be paid for by the Owner.

Cores may be taken at random locations selected by the Engineer throughout the Project.

The Engineer may order the removal of any material represented by core samples that does not meet the requirements of every characteristic as outlined in the NJDOT Specifications. The removal of such unsatisfactory material, repaving with acceptable material, and additional sampling and testing as deemed necessary by the Engineer, shall all be at the expense of the Contractor.

03 04 04 SURFACE REQUIREMENTS

All joints and the center seam shall be applied with a Polymerized Joint Adhesive as required by the latest NJDOT Specifications. The adhesive shall be applied to the newly paved center line joint prior to installing the opposite pavement pass. The joint adhesive shall be "Crafco, Inc. Pavement Joint Adhesive Part No. 34524" or approved equal. No separate payment shall be made for the use of a Polymerized Joint Adhesive.

The acceptance of bituminous concrete surface courses will be based upon the extent to which the finished surface drains water. The Contractor shall repair any and all pavement areas which are ponding water under the following conditions:

(A) Any area, regardless of size or depth, which is in an intersection, at handicap access ramps, drive aprons or within the parking lot drive aisles.

(B) Ponding in any other areas which ponds water deeper than one-quarter inch (1/4") at any point or is greater than five feet (5') in length, or greater than one foot (1') in width.

Repairs shall be made by full depth replacement of the wearing course, utilizing the same type of material. All methods of repair shall conform to the recommended procedures of the Asphalt Institute. All pavement cutting shall be accomplished with an approved asphalt saw. Jackhammer cutting will not be permitted.

The Engineer's evaluation of ponded areas will be made approximately one hour after a rainfall has ceased.

SECTION 03 05 - TRAFFIC STRIPING AND MARKINGS

03 05 01 DESCRIPTION

SECTION 02000 – SITE WORK

Traffic Striping and Markings shall include the purchase and installation of all the thermoplastic, epoxy resin and/or painted pavement striping of varying widths or markings as required by the construction plans. The striping shall be installed in all locations as indicated by the construction plans. Color shall be as indicated on the construction plans.

03 05 02 MATERIALS

Traffic striping and traffic markings shall conform to the requirements of Section 610 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation modified and amended as follows:

Stop bars shall be applied with white thermoplastic, centerline stripes shall be applied with yellow thermoplastic, parking stall, gore and loading zone striping shall be applied with white pavement paint and traffic markings shall be applied with white thermoplastic, unless otherwise noted on the plans.

03 05 03 METHODS OF CONSTRUCTION

The installation of traffic striping and traffic markings shall conform to the requirements of Section 610 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, modified and amended as follows:

Thermoplastic Pavement Striping and Traffic Markings shall be installed as soon as pavement surface and weather conditions permit.

The thermoplastic shall be applied on thoroughly dried surfaces when the ambient and surface temperatures are above 50 degrees F and rising. The thermoplastic material shall be readily applicable at temperatures between 400 and 440 degrees F from the approved equipment to produce 125 mils thickness.

Epoxy resin striping shall be installed as per manufacturer's specifications.

Prior to acceptance, additional applications of traffic stripes may be directed. These applications shall be applied at least 15 days after the initial application of traffic stripes and after any sawing or sealing of joints in bituminous concrete overlay.

The Contractor shall lay out the lines for traffic stripes, which shall be subject to the approval of the Engineer. The Contractor shall take care to record the location of all existing markings so they may be reapplied at the same locations. Irregular stripes shall be obliterated and reapplied by the contractor at his own expense.

SECTION 03 06 - CRACK SEALING

03 06 01 DESCRIPTION

This item shall consist of cleaning and sealing of cracks in the existing pavement surface in preparation for overlay, slurry sealing, and other miscellaneous surface treatment. The work shall be accomplished in accordance with these specifications and the applicable drawings.

03 06 02 MATERIALS AND METHODS OF CONSTRUCTION

All cracks ¼ inch wide or wider shall be sealed. The cracks shall be cleaned to a depth of approximately 1 inch by means of a random crack saw, carbide-tipped, rotary-impact router, commercial power-driven wire brush, or by other approved means. The Contractor shall provide acceptable protective screening if cleaning operations will cause damage to or interference with traffic in adjacent lanes. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface. If vegetation is a problem a soil sterilant shall be applied after cleaning and prior to placement of the sealant.

SECTION 02000 – SITE WORK

Immediately before sealant application, the cracks shall be cleaned and dried further with a hot compressed air lance (heat lance), or by air-blasting.

The cracks shall be sealed with a commercially available hot-poured polymer modified joint sealant product meeting any of the following specifications:

ASTM D3405/1190
AASHTO M-301-851
Federal Specification SS-S-1401C
FAA Specification P-605, Type II

The sealant shall be cut into small pieces to facilitate uniform melting and shall be melted slowly with constant stirring. A copy of the manufacturer's recommendations pertaining to the heating and application of the sealant material shall be submitted prior to the start of work. The manufacturer's recommendations shall be adhered to. The temperature of the sealant in the field application equipment shall not exceed the recommended safe heating temperature. Sealant material shall not be heated at the pouring temperature for more than six hours and shall not be reheated. The heating kettle or melter shall be equipped with temperature gauges to monitor heating temperature.

Sufficient sealant shall be applied by a pump and wand system into the cracks so that, upon completion of the work, the surface of the sealant is flush with or not more than 1/5 inch lower than the surface of the adjacent HMA surface course. If the sealant subsides to a lower level, another pouring shall be required. When more than one pouring is required to fill the cracks, succeeding pourings shall be done immediately after shrinkage of the previous pouring. Pouring shall be done in such a manner that the sealant is not spilled on exposed adjacent HMA surface course. Overfilling of the cracks shall also be avoided. If spilling or overfilling occurs, the crack shall immediately be squeegeed. If the Engineer determines that the overfilled crack or spilled sealant creates a slippery, hazardous, or otherwise undesirable condition, the area shall initially be corrected by sprinkling a light application of abrasive (sand or grit material) to absorb the excess materials, restore skid-resistance, and abate the condition caused by the overpour. After the excess material has been absorbed, the area shall be swept clean and restored to its original condition or texture to the Engineer's satisfaction. The Engineer may suspend the work, wholly or in part if overpouring continues, or if any undesirable condition caused by the overpour is not properly restored.

Traffic or construction equipment will not be permitted over the poured joints and cracks until the sealant has hardened sufficiently to resist pickup. The Engineer may direct dry sand to be sprinkled over poured areas at no additional cost to aid in resisting pick-up by traffic.

03 06 03 EQUIPMENT

All equipment shall be as specified herein or by the manufacturer or as approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

Hand squeegees, shovels and all other necessary equipment shall be provided to perform the work in a proper manner. Air compressors for air-blasting shall be equipped with oil and moisture-filtering systems.

03 06 04 CURING

Sealed joints may be opened to traffic after they have completely cooled, but not until the engineer has given his/her approval. Where possible, parking shall be prohibited for twenty-four (24) hours after the work is finished.

SECTION 03 07 - ASPHALT FABRIC

SECTION 02000 – SITE WORK

03 07 01 DESCRIPTION

This item includes the purchase, installation and shall consist of a geotextile interlayer intended to control cracking in underlying existing pavement surfaces in preparation for overlaying and other miscellaneous surface treatment. The work shall be accomplished in accordance with these specifications and the applicable drawings.

03 07 02 MATERIALS

The Asphalt Fabric material shall be polypropylene, staple fiber, needle punched nonwoven geotextile, calendared on one side and resistant to ultraviolet degradation having the following roll values:

Property	Test Method	Units	Property Requirement
Grab Tensile Strength	ASTM D-4632	N (lbs)	780 (175)
Grab Elongation	ASTM D-4632	percent	50
Thickness	ASTM D-5199	mm (mils)	1.65 (65)
Puncture Resistance	ASTM E-154	N (lbs)	890 (200)
Strip Tensile Strength	ASTM D-882 (modified)	N/m (lbs/in)	8760 (50)
Permeance-Perms	ASTM E-96 Method B		0.05 max
Pliability – ¼” Mandrel 180 deg, Blend at -25 deg F	ASTM D-146 (modified)		No cracks in fabric or rubberized asphalt

Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geotextile, at frequency exceeding ASTM D 4354 if required by the Engineer at no additional cost to the Owner.

The Asphalt Fabric shall be Petrotac 4591 as manufactured by Propex Inc., or approved equal.

03 07 03 METHODS OF CONSTRUCTION

The asphalt fabric shall be installed as per the manufacturer’s recommendations. Neither the asphalt sealant nor the geotextile shall be placed when weather conditions, in the opinion of the Engineer, are not suitable. Air and pavement temperatures shall be sufficient to allow the asphalt sealant to hold the geotextile in place. For asphalt cements, air temperature shall be 10°C and rising. For asphalt emulsions, air temperature shall be 15°C (60°F) and rising.

The surface on which the geotextile is to be placed shall be reasonably free of dirt, water, vegetation, or other debris. Cracks exceeding 3 mm (1/8 in) in width shall be filled with suitable crack filler. Potholes shall be properly repaired as directed by the Engineer. Fillers shall be allowed to cure prior to geotextile placement.

The sealant material used to impregnate and seal the geotextile, as well as bond it to both the base pavement and overlay, shall be a paving grade asphalt recommended by the geotextile manufacturer and approved by the Engineer.

SECTION 02000 – SITE WORK

The asphalt sealant (tack coat) application must be sufficient to satisfy the asphalt retention properties of the geotextile and bond the geotextile and overlay to the old pavement. When emulsions are used, the application rate must be increased to offset water content of the emulsion.

Application of the sealant shall be by distributor spray bar, with hand spraying kept to a minimum. Temperature of the asphalt sealant shall be sufficiently high to permit uniform spray pattern. For asphalt cements the minimum temperature shall be 150°C (300°F). To avoid damage to the geotextile, however, the distributor tank temperatures shall not exceed 160°C (320°F).

A spray pattern for asphalt emulsion is improved by heating. Temperatures in the 55°C (130°F) to 70°C (160°F) range are desirable. A temperature of 70°C (160°F) shall not be exceeded since higher temperatures may break emulsion.

The target width of asphalt sealant application shall be the geotextile width plus 150 mm (6 in). The asphalt sealant shall not be applied any farther in advance of geotextile placement than the distance the Contractor can maintain free of traffic.

Asphalt spills shall be cleaned from the road surface to avoid flushing and geotextile movement.

When asphalt emulsions are used, the emulsion shall be cured prior to placing the geotextile and final wearing surface. This means essentially no moisture remaining.

The geotextile shall be placed onto the asphalt sealant (calendared or smooth side up) with minimum wrinkling prior to the time the asphalt has cooled and lost tackiness. As directed by the Engineer, wrinkles or folds in excess of 25 mm (1 in) shall be slit and laid flat. Blooming and/or pneumatic rolling will be required to maximize geotextile contact with the pavement surface.

Overlap of geotextile joints shall be sufficient to ensure full closure of the joint but should not exceed 150 mm (6 in). Transverse joints shall be lapped in the direction of paving to prevent edge pickup by the paver. A second application of asphalt sealant to the geotextile overlaps will be required if in the judgement of the Engineer additional asphalt sealant is needed to ensure proper bonding of the double geotextile layer. Removal and replacement of geotextile that is damaged will be the responsibility of the Contractor.

Placement of the hot-mix overlay should closely follow geotextile laydown. The temperature of the mix shall not exceed 160°C (320°F). In the event asphalt bleeds through the geotextile causing construction problems before the overlay is placed, the affected areas shall be blotted by spreading sand. To avoid movement of, or damage to the seal-coat saturated geotextile, turning of the paver and other vehicles shall be gradual and kept to a minimum.

03 07 04 EQUIPMENT

The asphalt distributor shall be capable of spraying the asphalt sealant at the prescribed uniform application rate. No streaking, skipping, or dripping will be permitted. The distributor shall also be equipped with a hand spray having a single nozzle and positive shut-off valve.

Mechanical or manual lay down equipment shall be capable of laying the geotextile smoothly.

The following miscellaneous equipment shall be provided: stiff bristle brooms or squeegees to smooth the geotextile; scissors or blades to cut the geotextile; brushes for applying asphalt sealant to geotextile overlaps.

Pneumatic rolling equipment to smooth the geotextile into the sealant, and sanding equipment may be required for certain jobs. Rolling is especially required on jobs where thin lifts or chip seals are being placed. Rolling helps ensure the geotextile bond to the adjoining pavement layers in the absence of heat and weight associated with thicker lifts of asphaltic pavement.

SECTION 03 08 SOIL STABILIZATION GRID

SECTION 02000 – SITE WORK

03.08.01 DESCRIPTION

This item shall consist of a polypropylene material intended to be placed over poor, over undetermined or soft soils. The work shall be accomplished in accordance with these specifications and the applicable drawings.

The geogrid is manufactured from a coextruded, composite polymer sheet, which is then punched and oriented. The resulting structure consists of continuous and non-continuous ribs forming three aperture geometries (hexagon, trapezoid, and triangle) and an unimpeded suspended hexagon.

03.08.02 MATERIALS

The geogrid material shall be polypropylene, and resistant to ultraviolet degradation having the following Identification Properties:

Identification Properties	1 NX 850 & HX5.5	General
Aperture shapes		Hexagonal, Trapezoidal, & Triangular
Structure		Coextruded & Integrally Formed
Rib shape		Rectangular
Continuous parallel rib pitch(2), mm (in)		80 (3.2)
Rib aspect ratio(3)		>1.0
Node thickness(2), mm (in)		3.0 (.12) or 4.5 (0.18)
Color identification		White / Black / White

The Soil Stabilization Grid under vehicular travel ways shall be InterAx® NX850™ Geogrid as manufactured by Tensar, or approved equal.

The Soil Stabilization Grid under pedestrian travel ways shall be H-Series HX5.5™ Geogrid as manufactured by Tensar or approved equal.

03.08.04 METHODS OF CONSTRUCTION

The soil stabilization grid shall be installed as per the manufacturer's recommendations prior to the installation of dense graded aggregate, or other specified subbase material. A minimum of 6" of subbase material shall be installed over the geogrid. The geogrid shall not be placed when weather conditions, in the opinion of the Engineer, are not suitable. The soil stabilization grid shall be overlapped at least 12" at every joint, however it is based on the CBR rating and the contractor shall confirm the overlap based on the manufacturers specifications.

To ensure overlapping material should be zipped tied.

Material shall be install manually laid down smoothly. Material should be anchored using large stakes to keep material in place while installing the stone.

The following miscellaneous equipment shall be provided scissors or blades to cut the geogrid.

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DIVISION 04, MASONRY STRUCTURES

SECTION 04 01 - CONCRETE STRUCTURES

04 01 01 DESCRIPTION

Concrete Structures shall include the removal and construction of concrete stairs, ramps, walls, slabs, footings, curbs, sidewalks, driveway aprons, headwalls and other miscellaneous structures at the prescribed locations, to the prescribed lines, grades, dimensions and thickness, reinforcement in accordance with the Plans and Specifications. The work shall conform in all respects to the requirements of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation

04 01 02 MATERIALS

Cement used shall conform to the following requirements of the A.S.T.M. as amended and revised to date.

Standard Portland Cement A.S.T.M. Designation C-150, Type 1.

High Early Strength Portland Cement A.S.T.M. Designation C-150, Type 3

Air Entraining Portland Cement A.S.T.M. Designation C-150, Type 1A. Air Entraining Agent shall be Vinsol resin, Darex A.E.A. or approved equal.

Aggregates, both fine and coarse, shall conform to the requirements of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

Water shall be clean, fresh and free of oils, acids, salts, organic matter or other potentially injurious substances.

Concrete shall have 4% to 7% of entrained air, and shall be produced by using Standard Portland Cement with additive, or Air Entraining Portland Cement with additive as required. The Strength of concrete required for the various items of work shall be as shown on the Plans or in the Specifications.

Concrete shall have a 3” slump, with a tolerance of plus or minus 1”.

Reinforcement Steel shall be ASTM Grade 60 deformed bars, conforming to the requirements of AASHTO M 31.

Wire Mesh or Fabric shall conform to AASHTO M55 as amended and revised to date. Where specified, Fiber Mesh reinforcing shall be required in lieu of wire mesh and/or fabric.

Joint Filler shall be a cellular compression material conforming to the requirements of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

04 01 03 METHODS OF CONSTRUCTION

Prior to construction, the Contractor shall furnish a copy of the concrete mix design(s) to the Engineer for approval, including cut sheets on any proposed admixtures. Ready mix or transit mix concrete may be used if obtained from NJDOT approved sources. Equipment used to proportion and mix concrete on the job shall be subject to the approval of the Engineer.

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Forms shall conform to the shapes, lines, dimensions and grades shown on the Plans. They shall be firmly braced, tight and sufficiently substantial to prevent movement bulging or mortar leakage. Wherever concrete will be exposed to view, the forms shall be smooth and clean. Forms for footings may be omitted wherever soil conditions and workmanship permit accurate excavation to size. All forms shall be completely removed and taken from the site.

Reinforcement shall be accurately cut, bent and placed in accordance with the Plans. It shall be free of excessive scale or any foreign material that would tend to reduce bond. It shall be securely supported, tied and fastened with non-corrosive materials to prevent movement while concrete is being placed. It is not permitted to heat reinforcing to facilitate bending.

Subgrades, excavations and soil bases for all concrete work shall be properly finished to the prescribed lines, grades and dimensions, and shall be approved by the Engineer before concrete is placed. All areas to receive concrete shall be free of frost, foreign matter and excessive water, provided, however, that forms and soil surfaces shall be uniformly damp when the concrete is placed.

Concrete shall be handled and placed so as to avoid any segregation. Concrete which has begun to set or which has been contaminated with foreign materials or to which too much water has been added shall not be used. Pouring of concrete shall generally be a continuous operation until the placing of an individual section has been completed. Concrete shall be thoroughly compacted with vibrators or by other suitable means.

All concrete flat work shall be finished by screeding and floating to the required lines and grades. Unless otherwise specified, all work shall have a wood float finish, provided, however, that the Contractor shall provide other finishes when so required by the Plans or Specifications or so directed by the Engineer.

After the concrete has been poured, it shall be kept continuously wet for a period of three days or longer, as directed by the Engineer. Curing shall be done in accordance with Section 504.03 of the N.J.D.O.T. 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

Expansion joints, dummy joints, construction joints and other appurtenances shall be provided as shown on the Plans. Expansion joints shall have joint filler of the thickness indicated which shall extend the full depth of the concrete.

After removal of forms, all permanently exposed surfaces shall be cleaned of stains and dirt, and hand rubbed to produce a true surface of uniform texture and color. Voids or surface defects, which do not impair structural strength, shall be repaired by cutting and patching in a manner satisfactory to the Engineer.

Concrete shall not be poured when the atmospheric temperature is below 40° F. or when there is any precipitation, unless precautions satisfactory to the Engineer have been taken to protect the work. Precautions to protect concrete in cold weather shall be in accordance with the current recommendations of the American Concrete Institute.

04 01 04 SAMPLING AND TESTING METHODS

When specifically required by notation on the Plans or statement in the Supplemental Specifications, the Contractor shall perform sampling and testing of the concrete. No separate payment will be provided for such sampling and testing; the costs shall be included in the prices bid for the various items involving concrete construction. Sampling and testing of concrete shall be done in accordance with the 2019 Standard

SECTION 02000 – SITE WORK

Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation for road and bridge design Section 903.03 as follows:

AASHTO

- T 22 Compressive Strength of Cylindrical Concrete Specimen
(Including the Annex providing for use of neoprene caps)
- T 23 Making and Curing Concrete Test Specimens in the Field
- T 24 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- T 119 Slump of Portland Cement Concrete
- T 121 Weight Per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete
- T 126 Making and Curing Concrete Test Specimens in the Laboratory Sampling
Fresh Concrete
- T 152 Air Content of Freshly Mixed Concrete by the Pressure Method
- T 196 Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM

- C 567 Unit Weight of Structural Lightweight Concrete
- C 311 Sampling and Testing Fly Ash or Natural Pozzolans for Use as a
Mineral Admixture in Portland Cement Concrete. (See note)
Note - The Department may modify the sampling rate for individual and
composite samples.

SECTION 04 02 - CONCRETE CURB

04 02 01 DESCRIPTION

Concrete Curb shall include the removal and replacement of existing curbing where shown on the Plans or directed by the Engineer. It shall include but is not limited to the saw cutting, removal, excavation for and the construction of County, depressed, flush and standard curb in accordance with the Plans and Specifications, at the prescribed locations and to the prescribed lines, grades and dimensions.

The curb to be removed shall be sawcut from the existing curb to remain. The replacement curb shall be 6" x 8" x 18" curb as shown on the detail and as specified in Section 04 02 of this Specification. This includes any saw cutting, excavation, grading, and any other work required.

The Curb in the County Right of Way, regardless of material of construction, shall be removed and replaced where shown on the Plans or directed by the Engineer. The curb to be removed shall be sawcut from the existing curb to remain. The removed curb shall be transported to and deposited at an approved facility by the Contractor. The replacement curb shall be 8" x 9" x 20" curb or as shown on the detail and as specified in Section 04 02 of this Specification.

The Contractor shall be responsible for all pavement restoration preparation under this item. This includes any saw cutting, excavation, grading, and any other work required.

Any grassed area disturbed through the removal and replacement of curb shall be restored with topsoil and seed in accordance with Section 07 01 of this Specification which cost is to be included in this item.

04 02 02 MATERIALS

Concrete shall conform to the requirements of section 04 01 of the Specifications and be constructed with air entrained concrete with a minimum twenty-eight (28) day compressive strength of 4,500 psi. Concrete shall have a 4% to 7% of entrained air and shall have a slump of 4" plus or minus 1".

SECTION 02000 – SITE WORK

Joint Filler shall be a cellular compression material conforming to the requirements therefore of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

Reinforcement, when required, shall conform to the requirements of Section 04 01 of the Specification.

04 02 03 METHODS OF CONSTRUCTION

The Contractor shall make all necessary excavations, including demolition and removal of existing curb, paving and sidewalk, if any; and embankments for the construction of Concrete Curb, including disposal of excess material and demolished structures. Subgrades, excavations and embankments shall be prepared in accordance with the requirements of Section 04 01 of the Specification. No more excavation shall take place than may reasonably be expected to be formed and poured the following day.

Curb forms shall be removed no later than the day following the pour. Immediately after removal of the forms, the curb shall be backfilled. Backfill shall be compacted as soon as the concrete has gained sufficient strength to withstand the compaction process.

The Contractor shall exercise extreme care when utility appurtenances, i.e., water boxes, sanitary sewer cleanouts, etc., are present, and shall be solely responsible for repair or replacement of any and all damaged appurtenances at his own expense.

Forms for concrete may be of lumber or steel. They shall be straight and of sufficient strength to prevent warping or bulging and to retain the concrete accurately in position. All mortar and dirt shall be removed from forms which have been previously used. Forms shall be well staked to the lines and grades given by the Engineer and their upper edges shall conform to the finished surface of the curb. All forms shall be thoroughly wetted immediately before concrete is deposited against them. Curved forms shall be used for the construction of all radius curbs.

Slip forming may be used in lieu of standard forming methods. The slip form machine shall be equal to the Easi-Pour Model No. TP-880 as manufactured by Huron Manufacturing Corporation. However, the concrete shall have a slump of approximately one inch (1") and conform to machine requirements when extrusion construction is to be done.

Concrete construction, including curing, shall conform to the applicable requirements of Article 04 01 03 of these Specifications. The concrete shall be tamped and spaded or vibrated so that the forms are completely filled, the concrete thoroughly compacted, and mortar is flushed to the face and top. Before initial set, the top of the curb shall be finished with a wood float to an even, smooth and dense surface. As soon as the forms can be removed, the face of the curb shall be given the same finish. No voids or honeycombs will be permitted. Both final surfaces shall have a soft broom finish, utilizing a light horse-hair broom. Exposed edges shall be neatly rounded to the radius specified on the Plans.

Expansion joints shall be provided at intervals of 20 feet or when new curb abuts existing curbs or inlets. Expansion joints where new curb abuts existing curbs or inlets shall be filled with 1/2 inch thick cellular compression material to within 1/2 inch of the top and face of the curb and to within 1/4 inch of the top of the gutter.

Construction joint 1/16 inch wide shall be provided midway between expansion joints except where the distance between the adjacent expansion joint is less than 12 feet.

Expansion joints for slip forming shall be provided at intervals of 100 feet or when new curb abuts existing curb. Construction joints 1/16 inch wide shall be provided every 20 feet.

Finished curb shall be true to the required grades, lines, dimensions and curvatures. Completed work shall be protected from traffic and the elements and shall be thoroughly wetted and kept moist for at

SECTION 02000 – SITE WORK

least three (3) days. Damaged, broken or cracked work shall be renewed by the Contractor at his own sole cost and expense.

04 02 04 SAMPLING AND TESTING

Sampling and testing shall conform to the N.J.D.O.T. the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, sections 607, 903 and 904.

SECTION 04 03 –CONCRETE 4”, CONCRETE 6”, CONCRETE 8” THICK

04 03 01 DESCRIPTION

Concrete 4” Thick (Sidewalk) shall include the removal of installation of proposed and replacement of existing concrete sidewalk, including curb ramps, where shown on the Plans or as directed by the owner, prior to construction. It shall also include the Concrete 6” and 8” thick (reinforced) This includes the preparation of subgrade for and the construction of concrete flatwork of the types specified, in accordance with the Plans and Specifications, at the prescribed locations, and to the prescribed lines, grades and dimensions. The sidewalk to be removed shall be sawcut from the existing sidewalk to remain. The removed sidewalk shall be transported to and deposited at an approved facility by the Contractor.

All Concrete 4” Thick shall include fiber mesh reinforcement. Fiber mesh reinforcement shall be Sika 300 Fiber Reinforcement or approved equal.

All re-grading of the sidewalk areas is included under this item. All sidewalks shall conform to all pertaining specifications in Section 04. The contractor shall clear and grade all areas as shown on the plan where new sidewalk is proposed.

Wherever new concrete is poured adjacent to a new or existing building the contractor shall install a cellular compression joint material and install a self-leveling caulk.

No separate or additional payment will be made for adjusting manhole castings, utility valves and meters, etc.

04 03 02 MATERIALS

Concrete

Concrete shall be constructed with air entrained concrete with minimum twenty-eight (28) day compression strength of 4,500 psi. Concrete shall have 4% to 7% of entrained air and shall have a slump of 3” plus or minus 1”.

Joint Filler

Joint Filler shall be a cellular compression material conforming to the requirements therefore of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

Joint Sealant

Joint Sealer shall be self-leveling elastomeric type for Portland Cement Concrete Pavements conforming to ASTM Designation C920, Class 50, tack free within an 1 hr.

Reinforcement

Reinforcement when required and illustrated on the Plans or Details, shall conform to the

SECTION 02000 – SITE WORK

requirements of Section 04 01 02 of these Specifications.

04 03 03 METHODS OF CONSTRUCTION

The Contractor shall make all necessary excavations, including demolition and removal of existing sidewalks and aprons, if any; and embankments for the construction of concrete sidewalks and drive aprons, or 6" thick concrete, including disposal of excess material and demolished structures. Subgrades, excavations and embankments shall be prepared in accordance with and meet the requirements of Section 04 01 of the Specification. No more excavation shall take place than may reasonably be expected to be formed and poured the following day.

Immediately after the concrete paving is completed, the forms shall be removed, and the Contractor shall backfill and grade against the sidewalk in accordance with the Plans.

Forms for concrete may be of lumber or steel. They shall be straight and of sufficient strength to prevent warping or bulging and to retain the concrete accurately in position. All mortar and dirt shall be removed from forms which have been previously used. Forms shall be well staked to the lines and grades given by the Engineer and their upper edges shall conform to the finished surface of the paving. All forms shall be thoroughly wetted immediately before concrete is deposited against them.

Wherever utility appurtenances, i.e. water boxes, sanitary sewer clean-outs, etc., fall within the lines of Sidewalk or Drive Apron construction, the Contractor shall be responsible for assuring those appurtenances are flush with the final surface grade, are free of concrete and are in an operable condition.

Drive Aprons and Sidewalks over which vehicular traffic shall travel (Concrete 8") and Concrete 6" thick shall be formed and poured to a depth of six or eight inches (6" or 8") and shall be reinforced with 6x6-W2.9xW2.9. All other sidewalk areas shall be four inches (4") thick.

All Concrete 4", 6" and 8" Thick shall include a min. 4" subbase of Dense Graded Aggregate (DGA). Refer to Section 03 02 for material and installation requirements.

After being placed, the concrete shall be tamped, screeded and finished to true grade and surface. The finish shall be with a wood float, followed by brooming to a neat and workmanlike surface. Exposed edges shall be neatly rounded to a radius of 1/2 inch, unless otherwise noted on the Plans. The concrete shall be cured as provided in Article 04 01 03 of these Specifications.

Expansion Joints, 1/2 inch wide, shall be provided at intervals of 20 feet and where the new paving abuts curb or old work. The expansion joints shall be filled with 1/2 inch thick cellular compression material to within 1/4 inch of the top of the paving. For sidewalk, surface grooves shall be cut with an approved tool at least 1/4 inch thick at right angles to the line of the sidewalk and at intervals equal to the width of the sidewalk. Where new work abuts existing sidewalk, the surface grooves shall be spaced to conform to the lines of the abutting walk. All joint edges shall be rounded to the radius specified on the Plans.

The finished paving shall be true to the required grades, lines and curvatures. Completed work shall be protected from traffic and the elements. Damaged, broken or cracked work shall be renewed by the Contractor at his own sole cost and expense.

Curb, 4" Concrete, (Sidewalk) 6" Concrete Thick and drive way aprons shall be constructed in accordance with the Construction Details.

Before initial set, the top of the curb and the gutter shall be finished with a wood float to an even, smooth and dense surface. As soon as the forms can be removed, the face of the curb shall be given the same finish. Exposed edges shall be neatly rounded to the radius specified on the Plans. The finished curb shall not vary from the required grades, lines, dimensions and curvatures by more than 1/4 inch at any point. Completed work shall be protected from traffic and the elements and be thoroughly wetted and kept moist for at least one (1) day. Damaged, broken or cracked work shall be replaced by the Contractor.

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SECTION 04 04 - CURB RAMPS

04 04 01 DESCRIPTION

Curb ramps shall include the removal of the existing ramps, the preparation of subgrade for and the construction of curb ramps, in accordance with the Plans and Specifications, at the prescribed locations, using the prescribed materials and to the prescribed lines, grades and dimensions. Materials and methods of constructions shall comply with the requirements of Section 04 of these Specifications.

The existing handicap ramp or concrete shall be removed at each location shown on the Construction Plan. The removed concrete, wood, metal, asphalt or stone from the previously existing curb ramp or concrete sidewalk shall be transported to and deposited at an approved facility by the Contractor. Re-grading of the ramp area to match the Construction Plans shall be included. The proposed curb ramps shall be constructed at each location shown on the Construction Plan and comprised of concrete 4” or 6” Thick. The existing concrete curb and sidewalk shall be removed and replaced per the construction plans to install handicap ramps and adjacent sidewalks consistent with the detail at the locations indicated on the Plans. The curb to be removed shall be sawcut from the existing curb to remain. Sidewalk removal shall extend to the distance necessary to achieve the maximum permissible slope continued to the next existing joint. The replacement curb shall be as shown on the detail. The replacement sidewalk shall poured to the width indicated on the plans and 4 inches thick. For ramps not located at the sidewalk the ramp shall be constructed as shown on the plan and in accordance with the specified ramp detail. Any grassed area disturbed through the removal and replacement of curb shall be replaced with 4” thick topsoil, seed, & fertilizer.

Ramps constructed within County Rights of Ways shall be constructed as per the county requirements, including the use of county curb.

The ramps constructed within the site shall be built according to the specifications of the details provided on the plan including the installation of handrails as indicated.

04 04 02 MATERIALS

Unless otherwise specified, materials shall be as detailed on the Plans and within these specifications or approved equal.

Truncated domes shall be cast-in-place “ADA In-Line Universal Radius Replaceable Wet Set Composite TWS Unit” or cast-in-place “ADA In-Line Replaceable Wet Set Composite TWS Unit” as shown on the plans and as manufactured by ADA Solutions, Inc or approved equal. Color of units should be brick red.

04 04 03 METHODS OF CONSTRUCTION

Curb Ramps shall be constructed at the locations illustrated on the Plans. The ramp shall be constructed in full conformity with the detail included on the plans and shall meet the latest PROWAG standards for ramps located within the public right-of-way or ADAAG standards for ramps located outside of the public right-of-way and to the details shown on the Plans.

SECTION 04 05 - CONCRETE REPAIRS

04 05 01 DESCRIPTION

Provide and secure the complete repair of cracks and miscellaneous defects in the locations illustrated on the Plans and/or as specified in the supplemental specifications herein.

04 05 02 GROUTING RANDOM CRACKS

SECTION 02000 – SITE WORK

Cracks shall be repaired using Hydro Active Flex LV polyurethane grout in accordance with CFR 177.1680 or approved equal.

Random cracks shall be sealed from the positive side where practical. Surfaces shall be adequately prepared to remove any debris, spalled concrete, and deleterious material which could jeopardize adhesion by grout, epoxy, etc. Surfaces and cracks must be clean and dry before grout injection holes are drilled. Contractor shall submit typical injection hole drilling pattern, hole diameter and grout injection procedures to the Owner's Engineer for review before work commences. An actual demonstration will be required to satisfy the Owner's concerns of contractor procedures to adequately repair cracks.

04 05 03 REPAIR SPALLED CONCRETE

- A Materials - Spalled concrete repairs shall be made with Renderoc HBA, two-component polymer modified cementitious, fast setting, patch compound, SIKA Top 122 or 123, or approved equal. Repair material shall be applied in strict accordance with the manufacturer's recommendations, including surface preparation and temperature.
- B Surface Preparation - Concrete substrate must be structurally sound. Loose or unsound concrete should be hammered out. Surfaces must be entirely free of oil, grease, paint, corrosion deposits, dust, laitance, or other surface contaminants. They should be prepared by mechanical scarification or sandblasting. All dust or deposits produced during these procedures must be removed, preferably by vacuum cleaner. Embedded steel should be cleaned of corrosion and exposed to 100% of its circumference. Once cleaned, and prior to the repair application, the exposed metal should be coated with Nitoprime Zinc Rich primer or an approved equal.
- C Mixing - Renderoc HBA or an approved equal should be mixed on the job site in clean containers. A slow speed drill or mortar mixer should be used for mixing. It is advisable to add the powder to the liquid. Small quantities of Renderoc Liquid or an approved equal may be added or held back to enhance application consistency.
- D Priming - Dampen surfaces to be repaired with clean water, but make sure there are no standing puddles. All surfaces should be primed with slurry, using a masonry brush and scrubbed into the substrate. The slurry consists of 2 parts by volume of Renderox HBA powder (or approved equal) mixed into 1 part volume of Renderox Liquid (or approved equal). The slurry should be allowed to dry prior to application of the repair mortar.
- E Application - While the slurry is still damp, apply by trowel. The maximum thickness of any one layer of Renderox HBA (or approved equal) will depend upon its consistency, location and profile of the substrate to which it is applied. Typically, a vertical layer of 3 inches can be achieved, while overhead applications of 1 1/2" can be achieved in any one unsupported application. If forms are used, depths well in excess of these can be achieved in one application. For large and/or deep repairs mechanical anchors, studs, etc., shall be used. When multiple lifts of material are used to achieve desired thickness, each lift should be scratched and reprimed with slurry (priming) prior to the application of subsequent lifts. Initial cure should be achieved before the application of the next lift.

SECTION 04 06 – RETAINING WALL

04 06 01 DESCRIPTION

Work shall consist of constructing a Segmental Retaining Wall (SRW) system, including furnishing of all materials, labor, equipment, testing and inspection, in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the construction drawings.

SECTION 02000 – SITE WORK

Work includes excavation and foundation soil preparation, furnishing and installing the leveling pad, drainage fill, drainpipe, geogrid (if required), reinforced fill (if required), retained soil/fill, and geotextile filter (if required) to the lines and grades shown on the construction drawings.

04 06 02 REFERENCE DOCUMENTS

- A. National Concrete Masonry Association (NCMA)
 - 1. NCMA Design Manual for Segmental Retaining Walls, [3rd Edition]
- B. American Society for Testing and Materials (ASTM)
 - 1. Segmental Retaining Wall Units
 - a. ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
 - b. ASTM C1262 Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
 - c. ASTM C1372 Standard Specification for Dry-Cast Segmental Retaining Wall Units
 - d. ASTM C881/C881M Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
 - e. ASTM D6916 Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks)
 - 2. Geosynthetic Reinforcement
 - a. ASTM D4603 Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer
 - b. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
 - c. ASTM D5262 Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics
 - d. ASTM D5321/D5321M Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear
 - e. ASTM D5818 Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics
 - f. ASTM D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
 - g. ASTM D6638 Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)
 - h. ASTM D6706 Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil
 - i. ASTM D6992 Standard Test Method for Accelerated Tensile Creep and Creep-Rupture of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method
 - j. ASTM D7409 Standard Test Method for Carboxyl End Group Content of Polyethylene Terephthalate (PET) Yarns
 - 3. Soils
 - a. ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
 - b. ASTM D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction
 - c. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
 - d. ASTM D1241 Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses
 - e. ASTM D1556/1556M Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
 - f. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56 000 ft-lbf/ft³ (2 700 kN-m/m³))
 - g. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

SECTION 02000 – SITE WORK

- h. ASTM D3080/3080M Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- i. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- j. ASTM D4767 Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils
- k. ASTM D4972 Standard Test Method for pH of Soils

- l. ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- m. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- 4. Drainage Pipe
 - a. ASTM F667/F667M Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
 - b. ASTM F758 Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
- 5. Geotextile Filter
 - a. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
 - b. ASTM D4632/D4632M Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - c. ASTM D4491/D4491M Standard Test Methods for Water Permeability of Geotextiles by Permittivity
 - d. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - e. ASTM D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

- C. The Engineer/Landscape Architect shall make the final determination where specifications and reference documents conflict.

04 06 03 SUBMITTALS

- a. Submit manufacturer's certification, at least [30] days before start of SRW construction, attesting that the retaining wall system components meet the requirements of this specification.
- b. Submit technical data sheets and installation instructions for each manufactured product specified.
- c. Submit shop drawings and design calculations for the retaining wall system prepared, signed and sealed by a Professional Engineer licensed in the state of wall installation. Design shall meet all requirements established in NCMA Design Manual for Segmental Retaining Walls, 3rd Edition.]

04 06 04 DELIVERY, STORAGE, AND HANDLING

- a. The Contractor shall inspect the materials upon delivery to assure that proper type, grade, color, and certification have been received.
- b. The Contractor shall store and handle all materials in accordance with manufacturer's recommendations and in a manner to protect all materials from damage due to job site conditions. Damaged materials shall not be incorporated into the SRW.
- c. During delivery and storage, the Contractor shall protect geogrids from direct sunlight, ultraviolet radiation, heat and any other condition of the environment that would damage the geogrids.
- d. All geosynthetic material labeling, shipment and storage shall follow ASTM D 4873.
- e. The Contractor shall prevent chipping and cracking of SRW units and protect against any damage the connectors between the SRW units. Replace damaged SRW units as directed by the Engineer/Landscape Architect.

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- f. The Contractor shall prevent staining or otherwise damaged of the exposed face of the SRW units during storage and handling. Repair or replace, as directed by Engineer/Landscape Architect.

04 06 05

MATERIALS

DEFINITIONS:

- a. Segmental Retaining Wall (SRW) system: a system where the basic components are the foundation soil, the leveling pad, the concrete wall units, the geogrid reinforcement (if required), the reinforced fill (if required), the retained soil/fill, the drainage fill, and the drain pipe.
- b. SRW unit shall be a dry-stacked concrete retaining wall unit model name Semma as manufactured by Techo-Bloc or approved equal.
- c. Geogrid reinforcement: a geosynthetic material formed by a regular network of intersecting ribs with apertures of sufficient size to allow interlock with surrounding soil, stone, or other materials and designed specifically to reinforce soil mass.
- d. Drainage fill: a free-draining aggregate material placed in the cavities, between and extending behind the SRW units.
- e. Drain pipe: a perforated pipe used to collect and convey water to an outlet, removing incidental water from the drainage fill.
- f. Geotextile filter: a geosynthetic material comprised of textiles used adjacent to soil, allowing water to pass through it while retaining the soil on the upstream side.
- g. Reinforced fill: fill soil placed directly behind the drainage fill. It contains horizontal geogrid reinforcement as outlined on the plans.
- h. Retained soil/fill: an undisturbed native soil or fill soil placed directly behind the reinforced fill in reinforced soil SRW systems or behind the drainage fill in non-reinforced soil SRW systems.
- i. Leveling pad: a level surface consisting of aggregate material or unreinforced concrete placed to provide a working surface for placement of the SRW units.
- j. Foundation soil: Soil mass supporting the leveling pad and the reinforced fill soil zone of a SRW system.

SEGMENTAL RETAINING WALL UNITS:

- a. SRW unit shall conform to the requirements of ASTM C1372 and the following:
 1. Compressive strength \geq 5050 psi (35 MPa)
 2. Water absorption \leq 9 lb/ft³ (144 kg/m³)
 3. Durability to freeze-thaw cycles:
 - a. Mass loss \leq 1% after 100 cycles
 - b. Mass loss \leq 1.5% after 150 cycles
 4. Dimensional tolerances:
 - a. Height: \pm 1/16 in. (1.5 mm)
 - b. Width and length: \pm 1/8 in. (3.2 mm)
 5. Unit size, in (mm):
5 7/8 (150) (H) x 11 (279) (D) x 16 (406) (L)
 6. Face color: To be determined.
 7. Face finish: Split-face
 8. Batter:
 - a. Near vertical (tilt wall back slightly to achieve a slight positive batter);
 - b. 25/32 in. (20 mm) per course, 7.6-degree inclination from vertical

SHEAR CONNECTORS:

Shear connectors shall be 1 1/4-inch (32 mm) deep by 3 3/16-inch (80 mm) long by 1 inch (25 mm) tall made of high-density polyethylene (HDPE) to provide connection between wall units and geogrid reinforcement (if required).

GEOSYNTHETIC REINFORCEMENT:

- a. Geosynthetic reinforcement shall consist of geogrids manufactured for soil reinforcement applications and shall be manufactured from high tenacity polyester (PET) multifilament yarns

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which are woven and coated for dimensional stability and for protection. These geogrids shall be manufactured with a molecular weight (Mn) exceeding 25,000 g/mol and a carboxyl end group (CEG) count less than 30 mmol/Kg.

b. The Long-Term Allowable Tensile Strength of the geogrid shall be determined as follows:

$$T_{al} = T_{ult}/(RF_{CR} * RF_D * RF_{ID})$$

1. T_{ult} : Ultimate tensile strength conducted per ASTM D6637 and based on minimum average roll value (MARV).
2. RF_{CR} : Creep reduction factor based on a minimum duration of 10,000-hour creep testing according to ASTM D5262 extrapolated to a 75-year service life. $RF_{CR} = 1.45$ minimum.
3. RF_D : Durability reduction factor shall be determined from specific polymer and expected environment exposure. $RF_D = 1.1$ minimum.
4. RF_{ID} : Installation damage reduction factor shall be determined from product specific testing using on site soils or more severe soil type source. $RF_{ID} = 1.05$ minimum.

LEVELING PAD:

The leveling pad material shall be non-frost susceptible, well-graded sand and gravel with unified soil classification GW with dimensions as shown on the construction drawings. [The aggregate leveling pad shall meet the requirements of ASTM D1241, gradation C:]

Sieve Size	Percent Passing
1 inch	100
3/8 inch	50-85
No. 4	35-62
No. 10	25-50
No. 40	15-30
No. 200	5-15

The leveling pad material shall consist of a non-reinforced concrete base with dimensions as shown on the construction drawings. Unreinforced concrete leveling pad shall be cured a minimum of [12] hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of [2,500 psi (17.2 MPa)].

DRAINAGE FILL:

The drainage fill material shall be a clean crushed stone meeting the requirements of ASTM D448, size No 57.

REINFORCED FILL:

a. The reinforced fill soil shall be free of debris and consist of one of the following inorganic USCS soil types: GP, GW, SW, SP, SM meeting the following gradation as determined in accordance with ASTM D422:

Sieve Size	Percent Passing
1 inch	100
No. 4	100-20
No. 40	0-60
No. 200	0-35

- b. The maximum size shall be limited to 1 inch, unless tests have been performed to evaluate potential strength reduction in the geogrid due to installation damage.
- c. The pH of the backfill material shall be between 3 and 9 when tested in accordance with ASTM D 4972. Reinforced fill shall not be comprised of crushed or recycled concrete, recycled asphalt,

SECTION 02000 – SITE WORK

bottom ash, shale, or any other material that may degrade, creep, or experience a loss in shear strength or a change in pH over time.

- d. The reinforced fill material shall be free of sod, peat, roots, or other organic or deleterious matter including, but not limited to, ice, snow, or frozen soils. Soils with a plasticity index (PI) greater than 20 or a liquid limit (LL) greater than 40 shall not be used in the reinforced soil mass.
- e. Material can be site excavated soils where the above requirements can be met.

DRAINAGE PIPE:

- a. The drainage collection pipe shall be perforated or slotted polyvinyl chloride (PVC), or corrugated polyethylene (PE) pipe.
- b. The drain pipe shall be manufactured in accordance with ASTM F758 and/or ASTM F667.

GEOTEXTILE FILTER:

- a. The geotextile filter fabric shall be as specified on the construction drawings.

CONCRETE ADHESIVE:

- a. Concrete specific construction adhesive shall provide sufficient strength and shall be used to permanently secure the cap unit on the uppermost course of the SRW.

04 06 06

INSTALLATION

EXCAVATION:

- a. Contractor shall excavate to the lines and grades shown on the construction drawings.
- b. Contractor shall take precautions to minimize over-excavation and assure that safe excavations and embankments are maintained throughout the course of the project.
- c. Over-excavation and replacement of unsuitable foundation soils with approved compacted fill will be compensated as agreed upon with the Engineer/Landscape Architect
- d. Contractor shall verify location of existing structures and utilities prior to excavation and shall ensure all surrounding structures are protected from the effects of wall excavation.
- e. Excavation support, if required, shall be designed by the Contractor.
- f. All excavation shall be done in full accordance with the prevailing trench and excavation safety laws applicable to the project site.

FOUNDATION PREPARATION:

- a. Following the excavation, the foundation soil shall be examined by the Engineer/Landscape Architect to assure the actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with soil meeting the design criteria, as directed by the Engineer/Landscape Architect.
- b. Should testing and observations of the foundation soil by the Engineer/Landscape Architect verify that actual foundation soil strength is deficient, structural fill materials should be utilized.
- c. Contractor shall obtain approval from the Engineer/Landscape Architect for the foundation bearing surface prior to proceeding with construction.

GEOTEXTILE PLACEMENT:

If specified in the construction drawings, the approved geotextile shall be set over the prepared foundation soil extending towards the back of the excavation, up the excavation face and eventually over the top of the drainage fill to the back of the SRW units near the top of the wall as shown in the construction details.

LEVELING PAD PREPARATION:

- a. A minimum of 6 inch thick layer of compacted granular material shall be placed for use as a leveling pad up to the grades and locations as shown on the construction details. The leveling pad shall extend laterally a minimum of 6 inch in front and behind the SRW unit.
- b. The granular leveling pad material shall be compacted to a minimum of 95 % of the maximum standard Proctor density (ASTM D698). The leveling pad shall provide a firm, level bearing surface on which to place the first course of the SRW units.

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- c. A leveling pad consisting of 4 inch unreinforced concrete shall be placed for use as leveling pad up to the grades and locations as shown on the construction details. The leveling pad should extend a minimum of 4 inch from the toe and from the heel of the SRW unit.

SRW UNIT INSTALLATION:

- a. Install SRW units in accordance with manufacturer's instructions and recommendations, and as specified herein.
- b. The first course of SRW units shall be placed on the prepared leveling pad at the proper elevation and orientation as shown on the construction drawings or as directed by the Engineer/Landscape Architect. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.
- c. Place the front of the SRW units side-by-side. No gaps shall be left between the fronts of adjacent units.
- d. Drainage pipe shall be installed to maintain gravity flow of water outside of the reinforced/retained soil zone. Slope the drainage pipe [1 % minimum] to provide gravity flow to daylight at the lowest point of the pipe with outlets at a maximum of 50 feet (15 m); or 100 feet (30 m) if the pipe is crowned between the outlets.
- e. Place and compact drainage fill in and between adjacent units, and to a minimum depth of [13 inches (330 mm)] directly behind the units. Place and compact backfill soil behind drainage fill. Drainage fill shall be separated from other soils by the specified geotextile filter (if required).
- f. The top of each SRW unit shall be cleaned and free of foreign material before adding the next course.
- g. Install geogrid (if required) and install next course of SRW units with staggered joints. Ensure drainage fill and backfill are compacted before installation of next course.
- h. Install shear connectors per manufacturer's recommendations. Pull the SRW units forward until they are locked in place.
- i. Secure SRW units at exterior corners with the adhesive specified.

GEOGRID INSTALLATION:

- a. Geogrid reinforcement shall be installed in accordance with manufacturer's recommendations.
- b. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction drawings or as directed by the Engineer/Landscape Architect.
- c. Geogrid shall be oriented with the highest strength axis perpendicular to the wall face.
- d. The top of the SRW units shall be clean and free of debris before installing the geogrid reinforcement. Geogrid shall be laid horizontally on top of the SRW units and the compacted backfill. Geogrid shall extend to the front of the wall units but shall at no time be visible on the front face. Place the next course of SRW units over the geogrid.
- e. Geogrid shall be placed under tension and free from wrinkles prior to backfill placement on the geogrid. A nominal tension shall be applied to the reinforcement and maintained by staples, stakes, or pins until the reinforcement has been covered by at least 6 inches (150 mm) of backfill.
- f. Geogrid reinforcement layers shall be continuous throughout their embedment lengths. Splicing of the geogrid in the design strength direction (perpendicular to the wall face) is not permitted. Adjacent sections of reinforcement shall be butted in a manner to assure 100 percent coverage at each level.
- g. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum backfill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent displacing the fill and damaging or moving the geogrid.
- h. Rubber-tired equipment may pass over the geogrid reinforcement, if in accordance with the manufacturer's recommendations, at speeds of less than 10 mph (16 kph). Sudden braking and sharp turning shall be avoided.
- i. Follow manufacturer's guidelines and construction drawings for overlap requirements in curves and corners.

REINFORCED FILL PLACEMENT:

SECTION 02000 – SITE WORK

- a. Reinforced fill shall be placed as shown on the construction details. Backfill shall be placed, spread and compacted in such a manner that minimizes the development of wrinkles, movement or installation damage of the geogrid.
- b. Frozen materials shall not be incorporated into the work. Material shall not be placed over frozen ground, ice or snow.
- c. Reinforced fill shall be placed in maximum compacted lift thickness of 6 inches and shall be compacted in accordance with the specifications.
- d. Only hand-operated compaction equipment shall be allowed within 3 feet (0.90 m) of the back of the SRW units.
- e. At the end of each day's operation, the Contractor shall slope the last level of reinforced fill away from the SRW units to direct water runoff away from the wall face. The Contractor shall not allow surface water runoff from adjacent areas to enter the wall construction site.

CAP UNIT INSTALLATION:

- a. Cap units shall be bonded to the SRW units below using an all-weather concrete adhesive. The cap and SRW units shall be dry and swept clean prior to adhesive placement.
- b. Cut cap units as necessary to obtain proper fit.

CONSTRUCTION TOLERANCES:

- a. Vertical alignment control: ± 1.25 in. (32 mm) maximum over a 10 feet distance; 3 in. (75 mm) maximum
- b. Horizontal alignment control: ± 1.25 in. (32 mm) maximum over a 10 feet distance; 3 in. (75 mm) maximum
- c. Rotation: within 2 degrees from the established plan wall batter

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METHODS OF CONSTRUCTION

CONSTRUCTION TOLERANCES:

- A. Quality Assurance
 1. The Owner may retain the services of an independent testing and inspection firm to provide soil testing and quality assurance inspection for wall construction. This does not relieve the Contractor from securing the necessary construction quality control testing and inspection.
 2. Quality assurance shall include sufficient testing and observation to verify that wall construction substantially conforms to the design drawings and specifications.
- B. Quality Control
 1. The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications.
 2. Quality control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

SECTION 02000 – SITE WORK

DIVISION 05, UTILITY IMPROVEMENTS

SECTION 05 01 - MANHOLES, INLETS AND CATCH BASINS

05 01 01 DESCRIPTION

Manholes, Inlets, Catch Basins, and Yard Drains shall include purchase of new structures, the excavation for and the construction of these of these structures in accordance with the Plans and Specifications, at the required locations, and to the prescribed lines, grades and dimensions.

05 01 02 MATERIALS

Concrete shall conform to the requirements of Section 04 of these Specifications except that batching and mixing equipment may be of a size and type suitable for the work to be done, subject to the approval of the Engineer.

Concrete Block

Concrete Block for the construction of manholes, inlets and catch basins shall conform to the requirements of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, latest revision, Section 910. Concrete Blocks for manholes shall have the required radius and batter.

Brick

Brick shall conform to the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, Section 910.

Mortar

Mortar shall be 1:2 cement-sand mortar. Mortar materials shall conform to the requirements therefor of Article 4.1.2 of these Specifications.

Iron Castings

Iron Castings shall conform to the requirements of the American Society for Testing Materials Specifications for gray iron casting as amended and revised to date, supplemented as follows:

Castings shall be boldly filleted and arises shall be sharp and perfect. The castings shall be true to pattern in form and dimension, free of pouring faults, sponginess, cracks, blowholes and other defects which affect their strength and value for the service intended. The bearing surfaces of frames, covers, and grates shall be fitted together so as to prevent rocking and the pieces match-marked.

Ladder Rungs

Ladder Rungs shall be fabricated of rolled wrought iron conforming to the current American Society for Testing Materials Designation C-478 therefore and shall be subject to the approval of the Engineer.

05 01 03 METHODS OF CONSTRUCTION

Excavation and backfill shall conform to the requirements for subsurface structure excavation.

SECTION 02000 – SITE WORK

Manholes, inlets, catch basins and Trench Drain Channels, shall be constructed in accordance with the details shown on the Plans. Unless otherwise specified or directed, manholes, inlets and catch basins may be constructed of either brick, concrete block, 4000 psi Concrete, or Precast Reinforced Concrete Manhole Sections. The foundations for all manholes, inlets and catch basins shall be concrete as specified on the Plans.

Concrete constructions shall conform to the applicable requirements of Division 4 of these Specifications.

Concrete blocks and bricks shall be laid with vertical joints staggered. Joints shall be not more than 1/2 inch thick and shall be completely filled with mortar. The masonry shall be carried to such a height that a mortar joint not more than 1/2 inch thick will be required for setting the head casting without using split blocks or bricks. Outside walls shall be plastered with a 1/2 inch thick coat of mortar, troweled to a smooth finish.

Reset and New Heads

When so prescribed, the head castings of existing structures shall be taken up and reset to new elevation and new head castings shall be furnished and set on existing structures. The masonry of the existing structures shall be added to or removed as may be necessary to conform to new surface grades and elevations. All work shall be done in conformity with the requirements hereinabove.

Reconstructed Channels

When so prescribed, the channels of present structures shall be reshaped or raised and reshaped as may be necessary to conform to new flow patterns. The channels shall be reconstructed as indicated on the Plans, and all work shall be done in conformity with the requirements hereinabove.

Inlets Converted to Manholes

When so prescribed, existing inlets shall be reconstructed to serve as manholes. The inlet walls shall be removed to the necessary depth and a satisfactory wall transition shall be constructed to suit the dimensions of the specified manhole frames. New or reclaimed manhole frames and covers, as specified, shall be furnished and set on the reconstructed walls. All work shall be done in conformity with the requirements hereinabove.

Existing Castings

When so prescribed, manholes, inlets, catch basins and inlets converted to manholes shall be constructed using existing head castings reclaimed from structures on the Project that are to be abandoned. The castings shall be carefully removed from the existing structures, and all concrete, mortar and other adhering matter shall be removed before the castings are reset.

All curbs, pavements, bases, sidewalks and other surfaces and structures which have been damaged or disturbed in connection with the construction or reconstruction of manholes, inlets and catch basins, or the setting or resetting of head castings, shall be repaired or replaced in a manner satisfactory to the Engineer.

Channel Drains and Grates

Examine areas to receive pre-sloped channel drain system. Notify engineer if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

SECTION 02000 – SITE WORK

Install pre-sloped channel drain system in accordance with manufacturer's instructions at locations indicated on the Drawings. Contractor shall provide the necessary pipe as illustrated on the plans and tie channel drain into the proposed 'A' inlet utilizing a 4" HDEP pipe. Excavate trench to ensure proper bedding of concrete beneath and on both sides of channel. Install top of drain system level and to proper elevation. Ensure directional flow arrows located on bottom of channel are pointing in direction of flow, toward catch basin and/or evacuation outlet. Ensure catch basin is at required elevation and location to drain system. Apply silicon sealant to seal joints of drain system. Install and tape grates before placing concrete. Place concrete beneath and on both sides of drain system. Ensure concrete has a minimum compressive strength of 3,500 psi at 28 days. Concrete shall be as specified in Section 04. Recess top of drain system to be 1/8 inch below concrete finish grade. Protect installed pre-sloped channel drain system from damage during construction.

SECTION 05 02 – STORM DRAINS

05 02 01 DESCRIPTION

Storm Drains include the installation of the new drain pipes shall be of the types and sizes specified on the plans, and shall be constructed to the prescribed lines and grades, at the prescribed locations, and shall include the excavation for, trench restoration and the construction of new pipe drains for the collection and carrying of surface drainage and in accordance with the Plans and Specifications or as directed by the Engineer.

The pipes should be installed in accordance with the details in the Construction Plans. All trench repairs as shown on the details shall be included. All fittings associated with the installed piping shall be included. The cleanouts and fittings shall be installed as shown on the Construction Plans or as directed by the Engineer.

The Contractor shall be responsible for transporting and disposing of the removed materials at an approved facility. All areas disturbed by the removal of pipe shall be returned to original condition. All disconnections and reconnections to existing and proposed drainage structures shall be included.

05 02 02 MATERIALS

Plastic Pipe

Drainage Pipes shall be constructed in accordance with the details in the Plans, and the requirements of Section 601 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation as modified and amended as follows under Methods of Construction.

Drainage pipe and fittings shall be either corrugated or smooth interior as specified in the form of proposal, corrugated exterior perforated Polyethylene pipe conforming to current AASHTO Designation M294 utilizing only virgin AASHTO approved resins. The pipe shall be "N-12" as manufactured by Advanced Drainage Systems, Inc., Hi-Q pipe as manufactured by Hancor, Inc. or approved equal. All pipe shall be supplied with bell and spigot ends and provide a silt tight joint.

The prescribed sizes of pipes are nominal inside diameters. Pipes shall be of the size and length as shown on the plans. The product supplied under this specification shall be high density polyethylene corrugated or smooth exterior/smooth interior pipe. Twelve to Thirty-Six inch diameters shall conform to AASHTO M294 Type S.

Coupling bands, if required shall cover at least two (2) full corrugations on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D1056, Type 2. The pipe manufacturer shall install gaskets on

SECTION 02000 – SITE WORK

the coupling band. All coupling bands shall meet or exceed the soil-tightness requirement of the AASHTO Standard Specification for Highway Bridges, Section 23, Paragraph 23.3.1.5.4(e). Pipefittings shall conform to AASHTO M252 or AASHTO M294. Fittings approved by the engineer are also acceptable. Under all circumstances joints shall be silt tight at a minimum.

6” flat drainpipes, shall be multi-flow, having a horizontal installation method per the construction detail as illustrated in the plans. The product shall be multiflow as manufactured by Varicore Technologies, Inc. or approved equal. The Contractor shall submit shop drawings for the proposed underdrain system to be approved by the Engineer prior to construction.

This system shall include all the associated drainpipes, connections of all collection pipes, fasteners, attachments, end caps and all else necessary to complete the drainage system.

The Underdrain System shall also include the purchase and installation of all the ¾” clean drainage stone. This stone shall be sandwiched between two (2) layers of non-woven needle punched geotextile fabric.

The collection system shall be of flexible, prefabricated, rounded rectangular shaped, composite product.

The collection system shall be wrapped with a non-woven geotextile and shall be a non-woven needle-punched construction and consist of long-chain polymeric fibers composed of polypropylene, polyethylene or polyamide. The fibers shall be oriented into a multi-directional stable network whereby they retain their positions relative with each other and allow the passage of water as specified. The fabric shall be free of any chemical treatment or coating, which reduces permeability and shall be inert to chemicals commonly found in soil. The geotextile shall conform to the following minimum average roll values.

Weight	ASTM D-3776	4.0
Tensile Strength	ASTM D-4632	100
Elongation %	ASTM D-4632	50
Puncture, lb	ASTM D-751	50
Mullen Burst, psi	ASTM D-3786	200
Trapezoidal Tear, lb		42
Coefficient of Permeability	ASTM D-4491	.1 cm/sec
Flow Rate, gpm/ft ²	ASTM D-4491	100
Permittivity, l/sec	ASTM D-4491	1.8
Apparent Opening Size	ASTM D-4751	70 Max. US Std Sieve Opening
Seam Strength, lb/ft	ASTM D-4595	100
Fungus	ASTM G-21	No growth

The collection system core shall be made of a high-density polyethylene. The core shall be constructed using interconnected corrugated pipes that define and provide the flow channels and structural integrity of the drain. The geotextile shall function only as a filter. The core of the collection system shall conform to the following physical property requirements.

Thickness, inches	ASTM D-1777	1.0
Flow Rate, gpm/ft*	ASTM D-4716	30

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Compressive Strength, psf	ASTM D-1621 (modified sand method)	6000
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The underdrain pipes shall meet or exceed these specifications.

The fittings used with the collection system shall be of a "snap together" design. In no case shall any product be joined without the use of the manufacturer's connector designed specifically for the purpose.

Fittings shall be installed in accordance with the manufacturer's recommendations.

Backfill shall be consolidated in accordance with the plans or as directed by the engineer.

Any damaged collection system, or transport pipe shall be replaced or repaired by splicing in an undamaged section of like material at the contractor's expense.

Reinforced Concrete Pipe

Reinforced concrete pipe shall conform to the requirements of the American Society for Testing Materials Designation C-76, as amended and revised to date. Unless otherwise specified herein, reinforced concrete pipe shall be Class III, Wall B, except that reinforced concrete pipe with less than 2 feet of cover shall be Class IV, Wall B.

All reinforced concrete pipe shall have joints which conform to the requirements of the Engineer.

Elliptical reinforcing will not be permitted in circular pipe.

Ductile Iron Pipe

All DIP shall be ductile iron pipe (not cement lined) conforming to ANSI A 21.51 (AWWA C 151) of latest revision, with an asphaltic interior coating in accordance with ANSI/AWWA C151/A21.51-8.3, with either mechanical or push-on joints. Unless otherwise specified, the pipe shall be Thickness Class 52. All joints shall be fitted with rubber gaskets in accordance with ANSI/AWWA C111/A21.11-95.

05 02 03 METHODS OF CONSTRUCTION

Excavation and backfill shall conform to the requirements of Section 02 of these Specifications.

The Contractor shall provide adequate equipment and so operate it as to maintain an essentially dry excavation, stable trench bottoms, suitable working conditions and protection from water damage throughout and until the completion of the work.

Pipe shall be laid in straight lines between drainage structures except when otherwise specifically provided or directed by the Engineer. When deviation from a straight line is permitted, the deflection of each joint shall not exceed the manufacturer's recommended maximum for the type of joint and size of pipe being installed. All pipe shall be laid to uniform grades.

No defective or leaking pipe, joints, connections, manholes, inlets, or other parts of the work will be acceptable. All visible leakage of any description, and no matter where located, shall be corrected by the Contractor in a manner satisfactory to the Engineer.

Except when necessary to maintain a flow, storm drains shall not be placed in embankment until the

SECTION 02000 – SITE WORK

embankment has been constructed and consolidated to proposed finished grade or subgrade, or to an elevation not less than three feet above the proposed top of pipe, whichever is lower. After an embankment has been so constructed, trenches for storm drains shall be excavated as hereinabove specified.

When so required by the Engineer, the Contractor shall flush such newly completed storm drains as may be designated by the Engineer, in order to remove any foreign matter which may have accumulated therein during construction. The Contractor shall furnish all labor, material, equipment and water necessary for flushing and shall provide for the disposal of water used for flushing.

The contractor shall reconstruct, seal all new and existing penetrations as part of the storm pipe replacement at the existing and proposed structures in a manner acceptable to the Engineer. In some cases the penetration of an existing structure may require reconstruction and the contractor shall refer to Section 05 01 for restoration.

The locations of existing pipes and structures shown on the Plans are approximate, and before construction, the Contractor shall determine the exact location of all existing pipes and structures in the vicinity of the proposed work. Connections to existing pipes and structures, which have been abandoned, shall be plugged, demolished or removed as indicated on the plans or as directed by the Engineer.

All areas disturbed by pipe replacement shall be returned to original condition.

Plastic Pipe

Bedding and backfill material shall be clean crushed stone (non-deteriorating) 1" to 1 1/2" diameter free of fines. This material shall be placed around the pipe for the distances shown on either side and on top and bottom as shown on the detail or as required. The clean crushed stone material shall be wrapped in filter fabric.

Above the clean crushed stone material, trenches shall be backfilled base course subgrade with clean granular materials selected by the Engineer from materials excavated. Excavated pavement materials shall not be placed in backfills.

All delivered pipe shall be inspected. Damaged pipes will not be accepted. All existing pipe to be removed shall be disposed of at an approved facility.

Underdrain pipe system shall be laid with a slope as illustrated on the plans and install with a 6"-10" course of 3/4" clean drainage stone.

The fittings used with the collection system shall be of a "snap together" design. In no case shall any product be joined without the use of the manufacturer's connector designed specifically for the purpose.

Flat drain Fittings shall be installed in accordance with the manufacturer's recommendations.

Backfill shall be consolidated in accordance with the plans or as directed by the engineer.

Any damaged collection system, or transport pipe shall be replaced or repaired by splicing in an undamaged section of like material at the contractor's expense.

Reinforced Concrete Pipe

Each section of pipe shall be solidly bedded in the trench bottom and shall be supported for its full length except where excess excavation has been made for joints. Before making each joint, the ends of the pipes

SECTION 02000 – SITE WORK

and all joint members shall be thoroughly cleaned. All jointing shall be done in strict accordance with the manufacturer's recommendations and the direction of the Engineer. Joints of tongue and groove pipe shall be filled with mortar around their entire circumference. Mortar shall be 1:2 cement-sand.

Concrete cradles over existing pipes shall be constructed where and as directed by the Engineer. All concrete work shall conform to the requirements of Division 4, Section 1, of these Specifications.

05 02 04 SAMPLING AND TESTING

Sampling and testing shall conform to the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation

SECTION 05 03 - RECONSTRUCT INLET

05 03 01 DESCRIPTION

Reconstruct Inlet shall include patching all cracks, holes, and bad joints, inside and outside, with cement, waterproofing the manholes and reconstructing the inlet channel to accommodate proposed utility pipe connections, where proposed. The outside of the inlet is also to be waterproofed where possible.

05 03 02 MATERIALS

Waterproofing material shall be Parson Sealcrete as manufactured by Parson Environmental Products, Inc., Reading, Pa. or approved equal. This is an acrylic polymer modified hydraulic cement.

05 03 03 METHODS OF CONSTRUCTION

The inlets shall be repaired, and all cracks and holes filled with cement mortar, missing bricks or blocks shall be replaced, head bolts installed, ladder rungs added, the inlet cleaned, channels constructed and other work necessary to reconstruct the inlet prior to applying the waterproofing material. The surface shall be cleaned and prepared in accordance with the manufacturer's specifications.

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The waterproofing material shall be prepared and installed in accordance with the manufacturer's specifications. The inlet surface shall be prepared in accordance with the manufacturer's specifications.

SECTION 05 04 RECONSTRUCT MANHOLE

05 04 01 DESCRIPTION

Refurbish Manhole shall include patching all cracks, holes, and bad joints, inside and outside, with cement, waterproofing the manholes and reconstructing the manhole channel to accommodate proposed utility pipe connections, where proposed. The outside of the manhole is also to be waterproofed where possible.

05 04 02 MATERIALS

Manhole refurbishing materials shall be as manufactured by Parson Environmental Products, Inc., or approved equal. The exact product used shall be specifically for the application intended, e.g.. Parson RPM or Parsonpoxy FSI for channels, Parson MH Liner for coating manhole surfaces, Parsonpoxy FP for sealing precast joints, etc.

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05 04 03 METHODS OF CONSTRUCTION

The waterproofing material shall be prepared in accordance with the manufacturer's specifications. The manhole surface shall be prepared in accordance with the manufacturer's specifications.

The manholes shall be repaired, and all cracks and holes filled with cement prior to applying the waterproofing material. The surface shall be cleaned and prepared in accordance with the manufacturer's specifications.

Protective clothing shall be worn in accordance with the manufacturer's specifications.

SECTION 05 05 - SANITARY SEWERS

05 05 01 DESCRIPTION

Sanitary Sewers shall include the excavation for and the construction of pipelines for the collection and carrying of sanitary sewage in gravity flow systems. The sewers shall be of the types and sizes specified and shall be constructed to the prescribed lines and grades, at the prescribed locations, and in accordance with the Plans and Specifications or as directed by the Engineer. The term "Sanitary Sewer" shall include both mains and service laterals and risers.

05 05 02 MATERIALS

All materials and appurtenances shall conform with the respective manufacturer's requirements for standard, short and random lengths, size, class, description, marking, workmanship, chemical standards, tests, dimensions, strengths, tolerances, and shipment wherever not otherwise specified herein.

Ductile Iron Pipe

Ductile iron pipe (not cement lined) shall conform to ANSI A 21.51 (AWWA C 151) of latest revision, with either mechanical or push-on joints. Unless otherwise specified, the pipe shall be Thickness Class 52.

Ductile Iron Fittings

All ductile iron pipe shall be fitted with gray-iron or ductile-iron fittings, and all such fittings except wye branches shall conform to ANSI A 21.10 (AWWA C 110) of latest revision. Although wye branches are not specifically covered by the aforementioned standard, they shall meet all thickness, and dimensional requirements thereof, and shall be as manufactured by U.S. Pipe and Foundry Company or approved equal. Mechanical joint fittings shall be used with mechanical joint pipe, and either push-on or mechanical joint fittings shall be used with push-on joint pipe.

Poly Vinyl Chloride PVC Pipe and Fittings

Poly Vinyl Chloride (PVC) Pipe and Fittings shall conform to the requirements of American Society for Testing Materials Specifications therefore, as amended and revised to date. Unless otherwise specified herein when the burial depth is less than twelve (12) feet the poly vinyl chloride pipe and fittings shall be non-pressure, single gasketed, SDR 35, Type PSM PVC pipe and when the burial depth is in excess of twelve (12) feet the poly vinyl chloride pipe and fittings shall be non-pressure, single gasketed SDR-26, ASTM D-3034. Pipe joints shall be elastomeric type conforming to the requirements of the American Society for Testing Materials Specifications, as amended and revised to date. Pipe gaskets shall be rubber and shall conform to the American Society for Testing

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Materials Specifications for low head-pressure reinforced concrete pipe as amended and revised to date.

Joint lubricant shall conform with the requirements of the pipe manufacturer.

Only PVC adapters to other piping materials shall be used.

Concrete

Class 3000 psi concrete conforming to the requirements of Section 4.1 of the Specifications shall be used in the construction of drop connections at manholes, concrete cradles, pads, plugging pipes and sealing structures. Batching and mixing equipment shall be of a size and type suitable for the work to be done and shall be subject to the approval of the Engineer.

Laterals

Laterals should be constructed with the materials shown on the detail sheet of the Plan.

05 05 03 METHODS OF CONSTRUCTION

Excavation and backfill shall conform to the requirements for subsurface structure excavation.

Existing service connections to the sanitary sewer system are not shown on the Plans. Where new sewer mains are shown to be constructed, the Contractor shall investigate and determine the location of all existing service connections. The Contractor shall provide a Sanitary Sewer Lateral at each existing service connection and additional Laterals at locations designated by the Engineer.

Laterals that are not to be immediately connected shall be securely plugged with an approved type of plug which will provide a watertight seal. The Contractor shall provide for an uninterrupted sewage flow from each new and existing service connection and will be held responsible for any claims arising from his failure to do so. At the end of each day the sewer system is to be reconnected and operational.

The Contractor shall accurately record the lengths of pipe between manholes, wye branch connections stations and directions, lateral lengths, vent locations, and locations of plugs or connections to existing laterals. The rim and invert elevations and pipe slopes should also be recorded. The Contractor shall prepare and provide the Engineer with three (3) copies of as-built drawings showing this information.

Pipe shall be laid in straight lines between manholes except when otherwise specially provided. When deviation from a straight line is permitted, the deflection at each joint shall not exceed the manufacturer's recommended maximum for the type of joint and size of pipe being installed. All pipe shall be laid to uniform grades between manholes.

Each section of pipe shall be solidly bedded in the trench bottom and shall be supported for its full length except where excess excavation has been made for joints.

Before making each joint, the ends of the pipes and all joint members shall be thoroughly cleaned and lubricated when so recommended by the manufacturer. All jointing shall be done in strict accordance with the manufacturer's recommendations and the directions of the Engineer.

No defective or leaking pipe, fittings, joints connections, manholes or other parts of the work will be acceptable. All visible leakage of any description, and no matter where located, shall be corrected by the Contractor in a manner satisfactory to the Engineer, whether or not the total leakage into the sewer is within the allowable maximum as determined by infiltration tests.

SECTION 02000 – SITE WORK

Sanitary sewer infiltration tests shall be made. An air test of 3.5 PSI for 5 Minutes shall be conducted, with an allowable loss of .5 PSI in the 5-minute time frame. The tests shall be made between manholes on the sewer main and all related pipe, and fittings. The sewer main will then be lapped from manhole to manhole. Any and all leaks will be repaired by the Contractor at his own expense. Any and all deflection in the sewer mains deemed unacceptable by the Engineer or his representative, shall be repaired by the Contractor at his own expense. The Contractor shall furnish all labor, materials and equipment necessary to perform these sanitary sewer infiltration tests.

Wye branch connections and service laterals which are not to be immediately connected to flowing lines shall be securely plugged with an approved type of plug which will provide a watertight seal. The Contractor shall accurately record the Station of each wye branch placed and the direction of the wye. He shall also show the location of each wye branch on his copy of the Plans and permanently mark each location with a crosscut on the curb or a hub stake driven at the curb line.

Drop connections at manholes and concrete pads at service risers shall be constructed as shown on the detail sheet of the plans, and at the location shown on the Plans or as directed by the Engineer. Concrete cradles over existing pipes shall be constructed where and as directed by the Engineer. All concrete work shall conform to the requirements of Section 04 01, of these Specifications.

The Contractor shall clean newly completed sewers in order to remove any foreign matters which may have accumulated during construction. The Contractor shall furnish all labor, material, equipment and water necessary for flushing and shall provide for the disposal of water used for flushing.

The locations of existing pipes and structures shown on the Plans are approximate, and before construction, the Contractor shall determine the exact locations of all existing pipes and structures to which connections are to be made. Connections to existing pipes and structures shall be made in a manner satisfactory to the Engineer. Existing pipes and structures which have been abandoned shall be plugged, demolished, grouted or removed, as indicated on the Plans or in the Specifications. Service laterals which have been replaced shall be removed.

Upon completion of the backfilling operation, the Contractor shall provide a trench repair over the entire trench area as per the plans. The Contractor shall maintain the paving until such time as the permanent paving is installed.

SECTION 05 06 – JOINT AND LATERAL TESTING AND SEALING

05 06 01 DESCRIPTION

Joint and lateral seals shall include all work associated with the testing and installation of joint and lateral seals within existing pipelines whether for sanitary sewage or storm drainage for the purpose of sealing the joint. The joint and pipe seals shall be of the types and sizes specified, and shall be constructed in accordance with this specification, at the locations illustrated on the plans and at other locations as directed by the Engineer.

05 06 02 MATERIALS

All materials and procedures shall conform to the respective manufacturer's requirements for sealing pipe joints and lateral connections. Such seals shall also be in compliance with ASTM F2304-03 *Standard Practice for Rehabilitation of Sewers Using Chemical Grouting* and F2452-05 *Standard Practice for Sealing Lateral Connections and lines from the mainline Sewer Systems by the Lateral Packer Method, Using Chemical Grouting*, respectively. The material shall be non-toxic, stable, inert, and permanent chemical grout designed for the specific grouting application. The chemical grout shall stop infiltration of ground water and exfiltration of sewage in gravity flow sewers by creating a waterproof seal. Contractor shall submit specific product information for each method to Engineer prior to commencement of work.

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05 06 03 METHODS OF CONSTRUCTION

The pipeline to be sealed shall be prepared by removing all deleterious deposits from the pipe walls using appropriate cleaning process. Whatever method is adopted, the pipe must be as clean as reasonably possible to provide a reasonable working environment for the operators. Unless otherwise specified in the Supplemental Specifications, the Contractor shall be responsible for eliminating protruding laterals into the service main as part of the per unit cost to seal the lateral.

During pipe cleaning operations the gaps between the joints must be cleared of roots and debris leaving a clean area for “joint filling”. The joints are to be filled to the full depth of the gap and rendered flush with the internal surface of the pipe. All surplus material spillage is to be removed from the joint area after sealing.

05 06 04 TESTING

The integrity of each joint shall be tested two (2) times. Prior to sealing the joint(s), the Contractor shall test the static pressure of the joint. The Contractor shall pre-test the joint to determine if the joint requires grouting. The Contractor shall perform a post-sealing static pressure test on the joint. The joint shall be required to maintain the ASTM and Manufacturer’s minimum static pressure.

SECTION 02000 – SITE WORK

DIVISION 06, SITE IMPROVEMENTS

SECTION 06 01 – TRAFFIC CONTROL and WAYFINDING SIGNS

06 01 01 DESCRIPTION

The Contractor shall install MUTCD approved traffic control sign(s) as specified on the details in the construction plans and in the locations shown on the Construction Plans. The various signs are to include but are not limited to, accessible parking signs, Barrier Free Routes, Accessible Entrance locations, Handicap Loading and Unloading Zones, custom parking signs, and typical traffic control signs, all signs may need to be adjusted in the field. The signage shall be installed to meet the details shown on the Construction Plan. In addition, the contractor will be required to work with the district to provide custom parking signs to match some the current signs being removed in the various alternates.

The signage shall be compliant with the most recent MUTCD standards and shall have the date of manufacture shown on the back of the sign. Any costs associated with the installation of the signage shall be included in the appropriate base or alternate bid.

The installation of traffic control and barrier-free signage shall include the cost of this work complete, in place, all excavation, concrete, backfill, adaptations, restoration material, labor, equipment, installation of signs and all else necessary therefore and all else in connection therewith and incidental thereto.

The Contractor shall relocate any existing sign and post in the locations shown on the plans and in accordance with the details. This item shall include the removal of the sign from its current location and the re-installation of the sign in the location indicated on the Constructed Plan or as directed by the Engineer. This item shall include excavation, materials, backfill, restoration mater, labor, equipment, and installation of signs and all else necessary therefore and all else in connection therewith and incidental thereto. The contractor shall re-install the relocated sign according to the standards outlined for the installation of traffic signage.

06 01 02 MATERIALS

Traffic Control signs shall conform to the requirements of Section 612 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation modified and amended as follows

The sign materials shall conform to the requirements of the latest edition of the Manual for Uniform Traffic Control Devices (MUTCD).

Posts for traffic control signs shall be galvanized steel “U” posts conforming to Section 911.02 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation.

06 01 03 METHODS OF CONSTRUCTION

The installation of signs shall conform to the requirements of Section 612 of the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation, modified and amended as follows:

The signs shall be installed so the bottom edge of the sign is installed seven (7) feet above the finished grade elevation.

Each traffic control signpost shall be constructed with a breakaway sign post support. Street name signposts do not require breakaway supports.

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The Contractor shall install signs with the pole set at least three (3) feet below surface. Signage shall be a minimum of seven (7) feet high, measured from the ground to the bottom of the sign. This item does not include the installation of a sign that was previously not existing on the site. All traffic control signage shall meet the latest MUTCD standards. All traffic signs shall be retro reflective and be mounted on break away posts. Signs shall be installed in the locations shown on the plans.

The Handicapped Parking Sign shall be installed in the Bollard located in front of the parking space(s) shown on the Construction Plan. The Sign and Bollard construction shall match the detail included on the Plan set.

SECTION 06 02 - AUDIO/VIDEO DOCUMENTATION SURVEY

06 02 01 The Contractor shall provide all labor, material and equipment to provide a pre-construction color audio/video recording of the job site including parking lots, driveways, proposed pipelines, easements and fields within project site and within the municipal, county, and state rights of way and all other features that may be affected by construction. The audio/video recording shall also be used to verify that the laydown locations are restored to at least pre-construction conditions. No post construction audio/video documentation survey is required.

01 02 01 A Coverage includes, but is not limited to all existing roadways, sidewalks, curbing, driveways, structures, buildings, headwalls, retaining walls, culverts, ditches, landscaping, trees, shrubs, signing and monumentation located within the right of way.

01 02 01 B Distance from the camera lens to the ground shall not be less than twelve (12) feet to insure proper perspective.

06 02 02 SUBMITTALS

The Contractor shall submit to the Engineer:

Name and Address of the recording firm.
Copy of sample tape
Manufacturer of tapes
3 Letters of reference

An original and one copy of the audio/video recording shall be made. The original shall become the property of the Engineer. The audio/video recording must be delivered within five (5) working days after recording is complete, with written documentation and information retrieval procedures.

Owner or Engineer reserves the right to reject audio/video recording due to poor quality, unintelligible audio, uncontrolled pan and zoom. Re-recording shall be at the Contractors expense.

06 02 03 EXPERIENCE

All recordings shall be performed by a professional audio/video recording firm knowledgeable in construction practices and experienced in the implementation of established inspection procedures.

06 02 04 EQUIPMENT

Only broadcast quality camera capable of producing NTSC-500 lines or better shall be used. Recorders must be of professional or industrial grade only, as specified by the National Standard Code.

A DVD or electronic version of the video file must be submitted.

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06 02 05 PREPARATION

The project site and the public right of way shall be surveyed and marked by the Contractor before recording begins.

06 02 06 PERFORMANCE

All recording shall be done during normal business hours. Recording shall not be performed in inclement weather.

All information appearing on the audio/video recording must be continuous and run simultaneously by computer generated transparent digital information. Editing or overlaying of this information at a later date will not be permitted. Audio/video synchronization must be accurate to within 1/7 of a second.

Each audio/video recording must begin with the Owners name, Contractor's name, Contract name and number, Date and Location information. i.e. name of street, direction of travel, viewing side, etc.

A Continuous digital information at a minimum shall be as follows:

Upper left corner:	Lower left corner:
Name of Contractor	Route of travel
Day, Date and Time	Viewing side
	Street address

B Audio description shall be recorded simultaneous with the video recording. Special commentary shall be provided for existing buildings, sidewalks, foundations, trees, shrubbery etc. The street address shall be audibly described on the tape.

C Audio/video recordings shall be labeled with the following information:

Audio/video recording Number
Owners Name
Recording Date
Project Title and Number
Location and Standing Limit of audio/video recording

C Access and haul routes shall be recorded prior to their use. This will be a continuing requirement if changes in access and haul routes occur.

E Particular attention shall be paid to existing damaged areas. The nature and extent of such damages shall be documented to the extent that it maximizes defensible material in case of potential damage claims after construction.

F Particular attention shall be paid to existing areas in which locations will be subject to laydown/staging work. The laydown work shall be placed in the original location. The Contractor shall record the proposed laydown/staging location.

06 02 07 MASTER INDEX

To facilitate rapid retrieval of the survey data, an organized and detailed index of the contents of each tape shall be prepared. This master index shall be updated as new recordings are made.

SECTION 02000 – SITE WORK

SECTION 06 03 – CHAIN LINK FENCE

06 03 01 DESCRIPTION

Chain Link Fence shall include the furnishing and installation of Chain Link Fencing in accordance with the Plans and Specifications. Fencing shall be of the types and sizes specified and shall be constructed to the prescribed lines and grades at the prescribed locations.

Chain link gates shall be furnished and installed in accordance with the Plans and Specifications. The Gates shall be of the type and sizes specified and shall be constructed to the prescribed lines and grades at the prescribed locations.

06 03 02 MATERIALS

Except where otherwise specifically provided, Chain Link Fence shall conform to the following specifications.

FABRIC:

Shall be a steel chain link fabric height as indicated on the plans or specified elsewhere herein. Finish of fabric shall be per the construction plans and shall meet the specifications as noted below or approved equal.

Fabric shall be Zinc-Coated Steel meeting ASTM A392 for hot dipped galvanization before weaving (GBW). Fabric shall be Class 1 - 1.2 oz/ft² (366 g/m²).

Fabric shall be a Poly Vinyl Coated (PVC) Steel Fabric meeting ASTM F668 for wire gauge specified is that of the metallic coated steel core wire. Fabric shall be Class 2b fused and adhered, final color to determined.

Fabric Selection Table: Steel chain link mesh sizes and gauges produced in one-piece widths 3 feet (910 mm) to 12 feet (3660 mm)

Standard mesh size shall be 2" unless otherwise specified on the construction details and plans. However, if the fence is to be installed at tennis courts the mesh size shall be a maximum of 1-3/4".

Measurements between parallel sides of the mesh shall be as specified in the above table. The mesh

Mesh Size In. (mm)	6 gauge core 0.192 in. 4.88 mm	9 gauge core 0.148 in. 3.76 mm	11 gauge core 0.120 in. 3.05 mm	11 1/2 gauge core 0.113 in. 2.87 mm	12 Gauge core 0.105 in. 2.67 mm	Notes
2 (50)	yes	yes	yes	N/A	N/A	N/A = Not applicable for industrial/commercial applications
1 3/4 (44)	yes	yes	yes	N/A	N/A	N/A = Not manufactured
1 (25)	N/M	yes	yes	N/A	N/A	*12 ga. only per F668
5/8 (16)	N/M	yes	yes	yes	yes*	
1/2 (13)	N/M	yes	yes	yes	yes*	
3/8 (10)	N/M	N/M	yes	yes	yes*	
	2170 lbf (9650 N)	1290 lbf (5740 N)	850 lbf (3780 N)	750 lbf (3340 N)	650 lbf (2895 N)	Wire Break Strength

shall contain no knots, ties or splices except for top and bottom selvage which shall be knuckled into closed uniform loops.

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ROUND STEEL FENCE PIPE FRAMEWORK:

All framework shall meet one of the following specifications based on the fence post spacing, fence height and wind load requirements. All PVC coated framework shall meet the specifications noted within. Fence shall have Top, Mid and Bottom rail as specified. Tension wire may only be used if approved by the Engineer or as specified on the construction plans. Contractor shall verify all material sizing based on ASTM F567 Standard Practice for Installation of Chain Link Fence and the Chain-link Fence Manufacturers Institute. No additional payment will be provided should larger piping be required than identified on the plans.

Round steel pipe and rail Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating. The pipe shall be regular grade with a minimum steel yield strength 30,000 psi (205 MPa) or high strength grade with a minimum yield strength 50,000 psi (344 MPa). The top, brace, bottom and intermediate rails shall have 1.660 in. (42.2 mm) O.D.

Round steel pipe and rail shall be cold-rolled electric-resistance welded pipe in accordance with ASTM F1043 Materials Design Group IC (**LG-40**), minimum steel yield strength 50,000 psi (344 MPa). The pipe shall have Type B external coating, hot dip galvanized zinc 0.9 oz/ ft² (305 g/m²) with a clear polymeric overcoat and a Type D interior 90% zinc-rich coating having a minimum thickness of 0.30 mils (0.0076 mm). Top, brace, bottom and intermediate rails shall have a minimum 1.660 in. (42.2 mm) O.D.

Typical post and rail size for normal Commercial / Industrial applications

Item	Fence Height	Outside Diameter Inches (mm)	*F1083 Schedule 40 Weight lb/ft (kg/m)	F1043-IC (LG-40) Weight lb/ft (kg/m)
Line post	up to 6 ft. (1.8 m)	1.900 (48.3)	2.72 (4.0)	2.28 (3.39)
	over 6 to 8 ft. (1.8 to 2.4 m)	2.375 (60.3)	3.65 (5.4)	3.12 (4.64)
	over 8 to 12 ft. (2.4 to 3.7 m)	2.875 (73.0)	5.79 (8.6)	4.64 (6.91)
	over 12 to 16 ft. (3.7 to 4.9 m)	4.000 (101.6)	9.11 (13.6)	6.56 (9.78)
Terminal post	up to 6 ft. (1.8 m)	2.375 (60.3)	3.65 (5.4)	3.12 (4.64)
	over 6 to 8 ft. (1.8 to 2.4 m)	2.875 (73.0)	5.79 (8.6)	4.64 (6.91)
	over 8 to 12 ft. (2.4 to 3.7 m)	4.000 (101.6)	9.11 (13.6)	6.56 (9.78)
	over 12 to 16 ft. (3.7 to 4.9 m)	6.625 (168.3)	18.97 (28.2)	Not available
		8.625 (219.1)	28.58 (42.5)	Not available
Rails		1.660 (42.2)	2.27 (3.4)	1.84 (2.74)

*Regular Grade F1083 Schedule 40

Framework Wind Load Caution:

Fences containing windscreens or privacy slats and fences greater than 8 feet (2.4 m) in height using, 1 in. (25 mm) mesh or smaller - recommend a wind load force analysis for post selection and post spacing. See Chain Link Manufactures Institute – Wind Load Guide CLFMI: WLG 2445. A interactive Wind load Fence Post Calculator is available at www.wheatland.com

All Polymer coated pipe shall have a [PVC or Polyester] coating fused and adhered to the exterior zinc coating of the galvanized pipe in accordance with ASTM F1043. The minimum thickness of the PVC coating shall be 10-mils (0.254 mm), for polyester 3 mils (0.0076 mm).

The framework shall match the fence fabric color and final color shall be determined by the Engineer during the submittal phase.

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TENSION WIRE (if specified):

With Galvanized Fence

Shall be Metallic Coated Steel Marcellled Tension Wire: 7-gauge core (0.177 in.) (4.50 mm) marcellled wire complying with ASTM A824 and shall match the coating type to that of the chain link fabric to be Type II Zinc-Coated, meeting ASTM A817 Class 4 - 1.2 oz/ft² (366 g/m²)

With PVC Fence

Shall be Polymer Coated Steel Tension Wire with a 7-gauge core (0.177 in.) (4.50 mm) wire complying with ASTM F1664 and shall be Class 2b fused and adhered. Color shall match fabric and framework.

BARBED WIRE (if specified):

With Galvanized Fence

Shall be Metallic Coated Steel Barbed Wire and shall Comply with ASTM A121 and have a Design Number of 12-4-5-14R, being a double 12-½ gauge (0.099 in.) (2.51 mm) twisted strand wire, with 4-point 14-gauge (0.080 in.) (2.03 mm) round barbs spaced 5 inches (127 mm) on center. Match coating type to that of the chain link fabric. Strand wire coating shall be Type Z, Class 3, 0.80 oz/ft² (254 g/m²) and have a barb coating 0.70 oz/ft² (215g/m²).

With PVC Fence

Shall be Polymer Coated Barbed Wire: Comply with ASTM F1665, 14-gauge (0.80 in) (2.03 mm) double twisted galvanized steel strand core wire; zinc coated steel or aluminum alloy four point, 14 gauge (0.080 in.) (2.03 mm) barbs spaced 5 inches (127 mm) on center. The barbed wire shall match strand wire coating class and color to the chain link fabric and framework. Barbs will not be polymer coated. It shall be Class 2b fused and adhered.

FITTINGS:

Specifications are for both Galvanized and PVC fencing. When PVC fencing is specified, fittings shall be in compliance with ASTM F626 and shall have minimum coating thickness 0.006 in. (0.152 mm) fused and adhered to the zinc coated fittings. Coloring shall match that of the fabric and frame work specifications.

All fences and gates shall be constructed with all necessary components, fittings and accouterments to provide for a rigid, strong aesthetical structure. All posts and arms shall be provided with ornamental caps of an approved design. Top rails shall have an approved method for allowing expansion and contraction.

Tension and Brace Bands shall be galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.) (2.67 mm), minimum width of 3/4 in. (19 mm) and minimum zinc coating of 1.20 oz/ft² (366 g/m²). Secure bands with 5/16 in. (7.94 mm) galvanized steel carriage bolts.

Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves shall be in compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft² (366 g/m²).

Truss Rod Assembly shall be in compliance with ASTM F626 and be 3/8 in. (9.53 mm) or 5/16" (7.94 mm) diameter steel truss rod with a pressed steel tightener they will have minimum zinc coating of 1.2 oz/ft² (366 g/m²) and the assembly shall be capable of withstanding a tension of 2,000 lbs. (970 kg).

Tension Bars shall be in compliance with ASTM F626. They shall be galvanized steel one-piece length 2 in. (50 mm) less than the fabric height with a minimum zinc coating 1.2 oz. /ft² (366 g/m²). Bars for 2 in. (50 mm) and 1 ¾ in. (44 mm) mesh shall have a minimum cross section of 3/16 in. (4.8 mm) by

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3/4 in. (19 mm). Bars for 1 in. (25 mm) mesh shall have a cross section of 1/4 in. (6.4 mm) by 3/8 in. (9.5 mm). Small mesh fabric of 3/8 in. (10 mm), 1/2 in. (13 mm) and 5/8 in. (16 mm) the tension bars shall be attached (sandwiched) to the terminal post using a galvanized steel strap having a minimum cross section of 2 in. (51 mm) by 3/16 in. (4.8 mm) with holes spaced 15 in. (381 mm) on center to accommodate 5/16 in. (7.9 mm) carriage bolts which are to be bolted thru the strap the mesh and thru the terminal post.

Barbed Wire Arms shall be in compliance with ASTM F626, pressed steel galvanized after fabrication and have a minimum zinc coating of 1.20 oz. /ft² (366 g/m²), capable of supporting a vertical 250 lb (113 kg) load. [Type I – three strand 45-degree (0.785 rad) arm] [Type II – three strand vertical arm] [Type III – “V” shaped six strand arm]

TIE WIRE and HOG RINGS:

Contractor shall provide 9-gauge core aluminum alloy ties and hog rings per ASTM F626, unless, when added security or fence contain privacy slats is specified, a 9-gauge core (0.148) (3.76 mm) steel Galvanized Before Weave (GBW) with preformed power fastened wire ties and preformed hog rings having minimum zinc coating shall be required.

Bottom Tension Wire shall be provided on all fencing around play areas such as tennis courts, hockey courts, tot lots and baseball fields. Wire shall be 6-gauge, vinyl coated, galvanized steel stretched along the bottom of the fence and securely fastened to the fabric every 24” with ties of the same material as the fence fabric.

06 03 03 GATES

Gates shall be of the height and width indicated on the Plans or specified elsewhere herein. The following table sets the minimum sizes of gate frames and posts:

Nominal Pipe Size (ID)

Height of Gate	Nominal Gate Frame	Gate Opening	Nominal Gate Post
4' to 5'	1 ¼”	Single to 4' Double to 8'	2”
4' to 5'	1 ¼”	Single 4' to 8' Double 8' to 16'	2 ½”
4' to 5'	1 ¼”	Single 8' to 12' Double 16' to 24'	3 ½”
6' & over	1 ½”	Single to 6' Double to 12'	2 ½”
6' & over	1 ½”	Single 6' to 13' Double 12' to 26'	3 ½”
6' & over	1 ½”	Single 13' to 18' Double 26' to 36'	6”
6' & over	1 ½”	Single over 18' Double over 36'	8”

The fabric for gates shall be the same as that of the adjoining fence and fastened to the frame on all four sides. Gates shall be complete with hinges which clamp securely to the post to eliminate shifting and to allow the gate to swing back against the fence. After the hinges have been bolted to the gate and post, and the alignment checked, the hinges shall be welded permanently to the gate frame and post as a deterrent to vandalism. The welded areas shall be coated with a cold applied galvanized process equivalent to that specified. All gates shall have a provision to lock with a padlock. Locking cane drop bars shall be provided for each gate on a double leaf gate. Where gates are required on tennis courts, they shall provide a clear opening height of 7' and a transom panel above the gate. The transom panel shall continue to the top of the proposed fence line.

SECTION 02000 – SITE WORK

06 03 04 METHODS OF CONSTRUCTION

All work shall be performed in a neat workmanlike manner. Posts shall be set in concrete bases. All line posts for fences over 4 foot shall be set at a minimum depth of 36". End and corner posts for fences over 4 foot shall be set at a minimum depth of 36". Concrete bases for line posts shall have minimum diameter of 9", for end and gate posts 12". All fence posts shall have a maximum spacing of 10 feet from center to center. All concrete bases shall be domed to shed water.

All corner, gate and end posts shall be braced by an approved design and fitted with galvanized tension bands. Brace material shall be the same as the top rail. Braces shall be spaced midway between the top rail and the ground and shall extend from the terminal or corner post to the first adjacent line post. Braces shall be securely fastened to posts by suitable galvanized steel connections, then trussed from the line post to the terminal post with 3/8" inch round galvanized rods.

Fabric shall be tied to line post every 12" and to rails every 24" with wire ties made to the same specifications as the wire in the fence fabric.

06 03 05 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence as required for fence and post installation shall be included in the cost of the fencing items in the Form of Bid.

06 03 06 FRAMEWORK INSTALLATION

- A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 32 in. plus an additional 3 in. depth for each 1 ft. (305 mm) increase in the fence height over 4 ft. (1220 mm). Minimum footing diameter shall be four times the largest cross section of the post up to a 4.00" dimension and three times the largest cross section of post greater than a 4.00" dimension. **Local codes, site soil conditions, local frost depth, fence height and wind load may require larger diameter or deeper footings.** Top of concrete footing to be at grade and crowned to shed water away from the post or 6 inches below grade. Line posts installed at intervals not exceeding 10 ft. on center.
- B. Top rail: When specified, install 21 ft. (6.4 m) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. (152 mm) long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end. Fences 8 feet high or higher require mid rail.
- C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. (1.8 m) and higher and for fences 5 ft. (1.5 m) in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.
- D. Tension wire: Shall be installed 4 in. (101.6 mm) up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. (101.6 mm) down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire. Install the top tension wire through the barb arm loop for fences having barbed wire and no top rail.

06 03 07 CHAIN LINK FABRIC INSTALLATION

Chain Link Fabric: Install fabric to [outside or inside] of the framework maintaining a ground clearance of no more than 2 inches (50 mm). Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. (7.94 mm)

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carriage bolts spaced no greater than 12 inches (304.8mm) on center. Small mesh fabric less than 1 in. (25 mm), attach to terminal post by sandwiching the mesh between the post and a vertical 2 in. wide (50mm) by 3/16 in. (4.76 mm) galvanized steel strap using carriage bolts, bolted thru the bar, mesh and post spaced 15 in. (381 mm) on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches (304.8 mm) on center and to horizontal rail spaced no greater than 18 inches (457.2 mm) on center. Aluminum alloy tie wire shall be installed following ASTM F567. Wrap the tie around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns, cut off excess wire and bend over to prevent injury. Preformed 9 gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over to prevent injury. Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

06 03 08 GATE INSTALLATION

- A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F 567. Direction of swing shall be inward or outward as determined in the field, Contractor to coordinate swing with Owner. Gates shall be plumb in the closed position having a bottom clearance of 3 in. (76 mm), grade permitting. Hinge and latch offset opening space shall be no greater than 3 in. (76 mm) in the closed position. Double gate drop bar receivers shall be set in a concrete footing minimum 6 in. (152 mm) diameter 24 in. (609.6 mm) deep. Gate leaf holdbacks shall be installed for all double gates. Electrically operated gates must be manufactured and installed in compliance with ASTM F2200 and UL 325.
- B. Horizontal Slide Gates: Install according to manufacturer's instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs. (18.14 kg). Double gate drop bar receivers to be installed in a concrete footing as required by site conditions and codes. Ground clearance shall be 3 in. (76 mm), grade permitting. Electrically operated gate installation must conform to ASTM F2200 and UL 325.

06 03 09 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

06 03 10 ELECTRICAL GROUNDING

Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00 Site Grounding. A licensed electrical contractor shall install grounding when required.

06 03 11 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

SECTION 06 04 – ORNAMENTAL FENCE

06 04 01 DESCRIPTION

Ornamental Fence shall include the furnishing and installation of Ornamental Fencing in accordance with the Plans and Specifications. Fencing shall be of the types and sizes specified and shall be constructed to the prescribed lines and grades at the prescribed locations.

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06 04 02 MATERIALS

Except where otherwise specifically provided, Ornamental Fence shall conform to the following specifications.

The industrial ornamental aluminum fence system shall conform to Ameristar Echelon II, (Majestic, 3-Rail)_style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, or approved equal.

Fence post support at retaining walls shall utilize Sleeve-its and fabricated by Strata systems Inc. or approved equal.

MATERIAL:

Aluminum material for fence framework (i.e., tubular pickets, rails, and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.

The manufactured framework shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash, and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be (specify Black, Bronze, White, or Desert Sand). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

Material for fence pickets shall be 1" square x 0.062" thick (.125" wall for Invincible) extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's ForeRunner™ design with outside cross-section dimensions of 1.75" square. The top wall and internal web of the rail shall be 0.070" thick; the sidewalls shall be 0.070" thick for superior vertical load strength. Picket holes in the ForeRunner rail shall be spaced 4.715" o.c., except for Invincible style 6' long, which shall be, spaced 4.98" o.c. Picket retaining rods shall be 0.125" diameter galvanized steel. Fence posts and gate posts shall meet the minimum size requirements of Table 1. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.

Bracket to rail attachments shall be made using specially designed one-way tamperproof security nuts with carriage bolt. Bracket to post connections shall be made using self-drilling hex-head screws.

Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.

FABRICATION:

Pickets, rails, and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets.

The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part ForeRunner rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

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Completed panels shall be capable of supporting a 300 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.

Gates shall be fabricated using 1.75” sq. reinforced ForeRunner rail material, 2” sq. x .250” gate ends, and 1” sq. x .125” pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall be joined by welding.

06 04 03 METHODS OF CONSTRUCTION

All work shall be performed in a neat workmanlike manner. Posts shall be set in concrete bases or in Sleeve its with concrete. All line posts for fences over 4 foot shall be set at a minimum depth of 36”. End and corner posts for fences over 4 foot shall be set at a minimum depth of 36”. Concrete bases for line posts shall have minimum diameter of 9”, for end and gate posts 12”. All fence posts shall have a maximum spacing of 10 feet from center to center. All concrete bases shall be domed to shed water.

All new installation shall be laid out by the contractor in accordance with the construction plans.

06 04 04 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence as required for fence and post installation shall be included in the cost of the fencing items in the Form of Bid.

06 46 05 INSTALLATION

FENCE INSTALLATION:

Fence post shall be spaced according to Table 3, plus or minus ½”. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36” (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The “Earthwork” and “Concrete” sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

FENCE INSTALLATION MAINTENANCE:

When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces; 1) Remove all metal shavings from cut area. 2) Apply custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1 & 2 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufacturers’ warranty.

GATE INSTALLATION:

Gate posts shall be spaced according to the manufacturers’ gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers’ gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer’s recommendations.

Table 1 – Minimum Sizes for Echelon II Posts	
Fence Posts	Panel Height

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2-1/2" x 2-1/2" x .080" Alum. w/ reinforced web	Up to & Including 6' Height			
3" x 3" x .120" Alum.	Over 6' Up to & Including 8' Height			
4" x 4" x .250" Alum.	Over 8' Height Up to 10'			
Gate Leaf	Gate Height			
	Up to & Including 4'	Over 4' Up to & Including 6'	Over 6' Up to & Including 8'	Over 8' Up to & Including 10'
Up to 4'	3" x 3" x .120" Alum.	4" x 4" x .250 Alum. or 3" x 12 Ga. steel	4" x 11 Ga. steel	4" x 11 Ga. steel
4' 1" to 6'	4" x 4" x .250 Alum. or 3" x 12 Ga. steel	3" x 12 Ga. steel	4" x 11 Ga. steel	4" x 11 Ga. steel
6' 1" to 8'	4" x 11 Ga. steel	4" x 11 Ga. steel	4" x 11 Ga. steel	6" x 3/16" steel
8' 1" to 10'	4" x 11 Ga. steel	4" x 11 Ga. steel	6" x 3/16" steel	6" x 3/16" steel
10' 1" to 12'	4" x 11 Ga. steel	6" x 3/16" steel	6" x 3/16" steel	6" x 3/16" steel
12' 1" to 14'	6" x 3/16" steel	6" x 3/16" steel	6" x 3/16" steel	6" x 3/16" steel

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Span	For INVINCIBLE® 8' Nominal (91.25" Rail)		For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92.625" Rail)					
	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)		Industrial Universal (BB302)	Industrial Universal (BB303)	Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94-1/2"	95"	96"	96.5"	96"	96-1/2"	*97.5"	*98"

Span	For INVINCIBLE® 6' Nominal (71.375" Rail)		For CLASSIC, GENESIS, & MAJESTIC 6' Nominal (67.75" Rail)					
	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)		Industrial Universal (BB302)	Industrial Universal (BB303)	Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	75"	75.5"	71.5"	72"	71.5"	72"	*73"	*73.5"

*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.

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Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

SECTION 06 05 – SHADE STRUCTURE

06 05 01 DESCRIPTION

The Contractor shall purchase and install shade structure. Contractor shall provide all necessary materials for manufacturers recommended installation process, and provide necessary labor and equipment to complete the site improvements as described herein and as shown on the drawings, which includes the following:

The shade structure as manufactured by Shade Systems, Inc. or approved equal. The contractor shall install the shade structure in the location shown on the plans.

The contractor shall supply and design concrete footings and any additional necessary items for the installation of the Shade Structure as per manufacturers specifications. Design of the shade structure footings shall be prepared as a Contractor Delegated Design submittal prepared by a Licensed New Jersey Professional Engineer in good standing.

06 05 02 ENGINEERING DATA

Structures are engineered to meet or exceed the requirements of the International Building Code (IBC), with the following specifications:

Wind speed Frame only: 165 m.p.h.
Frame w/canopy: 90 m.p.h.

Live Load: None
Snow Load: None

06 05 03 MATERIALS

All materials shall be structurally sound and appropriate for safe use. Product durability shall be ensured by the use of corrosion-resistant such as stainless steel, and coatings as zinc-plating, galvanizing, and powder-coating on steel parts, subject to the Project-Specific requirements. Fabrics used shall be include UV-stabilizers and fire retardants for longevity and safety.

WELDMENTS:

All tubing members are factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship. Weldments are finished with a zinc-rich galvanized coating.

POSTS, STRUCTURAL FRAME TUBING, AND HARDWARE:

All tubing used shall be cold-formed and milled per ASTM A-135 and ASTM A-500. Material testing is in accordance with ASTM E-8. Minimum yield is 40,000 psi with a minimum tensile strength of 45,000 psi on all posts. All tubing shall be pre-cut to appropriate lengths, and where applicable all outside surfaces shall be

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galvanized, with an interior corrosion-resistant zinc-rich coating. Where required, support pipes shall be schedule-40 hot-dip galvanized or powder-coated black steel. All fastening hardware shall be stainless steel.

ARCHITECTURAL POWDER-COATING PROCESS:

All powder-coated parts undergo a rigorous multi-step process to ensure colorfastness and durability per the specific sequential steps itemized below. All parts are completely sandblasted, pre-treated, and coated with coastal primer prior to powder coating. Powder-coating is then electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit. Powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance. Colors shall be specified.

The following seven (7) specific steps shall occur in sequence:

1. **Sandblasting.** All powder-coated parts shall be completely sandblasted with the use of 80 grit garnet abrasives.
2. **Mechanical smoothing.** A traditional mechanical method shall be used for removing remaining foreign matter for surface preparation by use of sanding, grinding, and rounding rough edges to smoothness.
3. **Initial Surface Preparation.** A heavy-duty liquid cleaner such as Calvary Industries Inc Cal Clean 675 shall be applied for initial surface preparation.
4. **Corrosion resistant Coating.** A liquid detergent iron phosphate, such as Calvary Industries Inc, Cal Prep 63, shall be applied, thereby resulting in a superior quality corrosion resistant coating.
5. **Final Surface Preparation.** All parts shall then be sealed using a reactive, non-chrome sealer product such as Calvary Industries, Advantech S1488E Sealer. The sealer enhances corrosion protection and increases paint adhesion, effectively increasing salt spray hours on all metal substrates.
6. **Coastal Primer.** Prior to powder-coating, a rust inhibiting coastal primer shall be applied on all parts, such as PPG Envirocron™. The coastal primer coating provides a combination of good physical and chemical resistance properties, and is the ideal solution for smooth, low-bake durability and physical property requirements for the most demanding environments.

Primer attributes:

Gloss (ASTM D-523):	0-10 @ 60o
Adhesion (ASTM D-3359):	100% (5B Pass)
Hardness (ASTM D-3363):	2H Pencil (Eagle)
Impact Resistance (ASTM D-2794):	80 In.-lbs. Direct
Conical Mandrel (ASTM D-522):	1/8" - No Cracking
Salt Spray (ASTM B-117):	4000 Hours Pass
1000 Hours (degrease only)	
Humidity (ASTM D-1735):	100F, 100% RH-2000+ Hours
Scab Corrosion (SAE-J2334):	120 Cycles - Pass
Film Properties (Thickness):	2 mils

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7. Application of Powder-Coating. Lastly, PPG Envirocron™ Ultradurable powder coatings shall be used to provide a combination of excellent physical and chemical resistance properties, outstanding resistance to outdoor weathering, and a durable and uniform final coat.

Powder Coat Characteristics:

Gloss (ASTM D-523):	80 Minimum @ 20o
Gloss (ASTM D-523):	80 Minimum @ 60o
Adhesion (ASTM D-3359):	100% (5B Pass)
Hardness (ASTM D-3363):	2H Pencil (Eagle)
Impact Resistance (ASTM D-2794):	40 In.-lbs. Direct
20 In.-lbs. Reverse	
Conical Mandrel (ASTM D-522):	1/8" Mandrel - No Cracking
Salt Spray (ASTM B-117):	1000 Hours Pass
< 1/8" Scribe Creep	
No Blisters	
Humidity (ASTM D-1735):	1000 Hours Pass
< 1/16" Scribe Creep	
No Blisters	
Film Properties (Thickness):	3 mils

STANDARD FOOTINGS:

Footings shall be designed per stringent International Building Code (IBC) for the specific structure. Columns will be provided as optional pier mount (contractor to provide all necessary hardware).

ROOFING:

Structural frames and/or fabric sails are designed by Shade Systems only for use with CoolNet™ polyethylene shade fabric or approved equal. Fabric is attached to frame or columns using the Fastening Systems below in conjunction with vinyl covered stainless steel cables. Cable fasteners are zinc-plated copper for maximum corrosion resistance.

FASTENING SYSTEM (Frame Structure):

Coolnet™ Shade Fabric or approved equal shall be delivered complete with independent cables pre-inserted in fabric hems. Each cable shall be looped and clamped at each end. Fastening System consists of the Turn-N-Slide™ fastening device which is factory installed at each roof rafter corner. The Turn-N-Slide features a concealed mechanism which allows the attachment hook and sleeve at each rafter corner to move along a track in the rafter. Cables are attached to hook which is welded to the moving sleeve, thereby distributing tension evenly over rafters and not directly onto the mechanism. Rafters are sealed with no penetrations on the top side, thereby preventing water from entering. Such moving sleeve with hook allows the looped ends of each cable to slide over the hook when the sleeve is at its upper position, and then by turning the concealed fastener within the rafter, moves the sleeve with hook outward (toward end of rafter), thereby tensioning the cables and securing the fabric at the proper tautness. A locking cap is secured at the end of each rafter with a vandal-resistant bolt (special wrench provided by the manufacturer) to prevent unauthorized access to the Turn-N-Slide mechanism. To remove the canopy, the cap is removed, and the mechanism rotated counter-clockwise. The sleeve with hook moves inward (toward peak of roof), thereby de-tensioning the cables, and allows fast removal of the canopy. Continuous one-piece cables, cables which are not independent per side and pre-looped and clamped at the factory, and/or cables which must be tensioned with the use of turnbuckles or tools not provided by the manufacturer are not acceptable. Structures which do not feature the Fastening Mechanism on each and every rafter, or fastening mechanisms which do not feature a sealed top rafter and moving outer sleeve such as the Turn-N-Slide, are not acceptable.

FASTENING SYSTEM INSTRUCTIONAL VIDEO:

Contractor to provide a instructional video on an USB Flash Drive. Video must show the viewer the exact procedure for removing and re-attaching canopy using an actual shade structure in the field.

FASTENING SYSTEM (Sail Structure):

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CoolNet™ Shade Fabric or approved equal shall be delivered complete with fastening system installed. Fastening System to consist of factory-formed stainless steel tensioning plates pre-attached to fabric canopies at each corner, and cables per the above hemmed into the fabric at the factory and terminating in the bracket. Posts shall be equipped with an adjustable 360-degree swivel and pivot attachment mechanism to which the tensioning plate fastens. Tensioning plate includes a stainless-steel adjustment bolt which, when turned, tensions the fabric for a taut fit. Fabrics, cables, and brackets which are not pre-assembled at the factory are not acceptable. Cables which attach to posts with U-bolts or 'S' hooks, and which do not use a stainless-steel bracketing system similar to the above are not acceptable.

SHADE FABRIC:

Knitted of monofilament and tape construction high density polyethylene with Ultra-Violet (U.V.) stabilizers and flame retardant. Coolnet™ or approved equal, offers the ultimate combination of maximum sun protection, strength and durability to ensure maintenance free long-life performance. UV- Block Factor varies by standard color offered from 90% to 97%.

Coolnet™ Properties:

Nominal Fabric Mass:	Min. 340 g/m2 // 10 oz/yd2
Fabric Thickness:	ASTM D5199-12 .06 inch
Temperature Range:	-50OF to 248OF
Roll Width:	9 ft. 10 in.
Roll Length:	131 ft.
Tensile Strength:	ASTM D5034-09 Warp (189.1 lbf) / Weft (462.3 lbf)
Elongation:	ASTM D5034-09 Warp (88.7%) / Weft (49%)
Tongue Tear:	ASTM D2261-13 Warp (39.6 lbf) / Weft (43 lbf)
Burst Strength:	ASTM D6797-15 408.0 lbf
Flammability:	ASTM E-84 Class A
Lead:	PASS
Phthalate:	PASS

Coolnet™ Shade Fabrics or approved equal meet the most stringent Fire Standards for shade fabrics including CSFM 1237.1 and NFPA 701 across all color variants.

All hems and seams are double row lock stitched using exterior grade UV-stabilized polyethylene GORE™ TENARA® sewing thread (GORE and TENARA are trademarks of W. L. Gore & Associates).

06 05 04 INSURANCE

Manufacturer must show acceptable evidence of the following minimum insurance coverages, all written on the Occurrence Form:

- Commercial Product Liability/Completed Operations of \$1,000,000 per claim and \$2,000,000 aggregate;
- Professional Liability (Errors & Omissions) of \$2,000,000 per claim;
- And an additional \$5,000,000 umbrella coverage.

06 05 05 WARRANTY

Shade Systems, Inc. or approved equal warrants that the equipment sold will conform in kind and quality to the specifications listed in the Order Acknowledgment and will be free of defects in workmanship or materials.

LIMITED 20 YEAR WARRANTY on all upright posts, cables, and tensioning plates against failure due to rust-through corrosion.

- LIMITED 10 YEAR WARRANTY on all CoolNet™ fabric and GORE™ TENARA® stitching thread against degradation, cracking or material breakdown resulting from ultra-violet exposure. This warranty excludes failure of fabric due to chemical erosion or as a result of flying objects.

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- LIMITED 1 YEAR WARRANTY on powder-coating, or any other product or part not covered by one of the above warranties.

The above warranties are not pro-rated. Please refer to the full text of our complete Limited Warranty for additional details and other important warranty information.

06 05 06 MANUFACTURER EXPERIENCE:

Bidder must show evidence of at least six (6) public municipal installations where manufacturer's product as proposed pursuant to this bid has been installed and has been in continuous use for a minimum of five (5) years each.

06 05 07 INSTALLATION AND SAFETY

Refer to the dimensions shown in the Plan View for your Shade System and make sure there is adequate space to install the structure. Avoid locations which would bring the support posts dangerously close to traffic patterns of motorized equipment or vehicles.

Refer to the height dimension shown in the Elevation view for your Shade System, and make sure you avoid overhead obstructions such as tree or roof overhangs. Remember that trees which do not conflict with your Shade System's canopy now will grow and may damage your Shade System if not trimmed continuously in the future.

If installing your Shade System over playground equipment, please follow the playground equipment manufacturer's recommendations for safe distances to maintain between the Shade System's posts and canopy and all parts of the playground equipment in compliance with federal Consumer Product Safety Commission (CPSC) guidelines. If uncertain of safe distances, contact the CPSC in Washington, D.C., for a copy of the latest guidelines which apply to playground equipment.

GENERAL INSTALLATION GUIDELINES:

Compare all parts received to the Packing List. Notify Shade Systems, Inc. immediately of any missing parts.

Site layout should include accurate measurement and marking of all footings prior to any installation. A level and clear site is recommended.

The installation of your Shade System may require compliance with local building codes and permitting.

Contractor to provide signed and sealed drawings.

Excavate holes at locations as shown in the engineering drawing using a string line. An optional string line level is very helpful. If a completely level site is not possible, adjust the depth of footings to maintain the footing depth shown on your drawing as a minimum at the lowest grade. NOTE: If soil conditions are very loose or otherwise unstable, a larger diameter footing may be required.

When concrete is poured, be sure to keep the top below grade and sloped away from the post to encourage good water drainage. Wash off any concrete which may have splashed onto the post before it dries. Allow all concrete to cure a minimum of 72 hours before fastening the frame and canopy.

If your Shade Systems installation requires field-drilling any holes, prior to installing fastening hardware, brush away all metal filings and prime all drilled or cut surfaces with "Skyco Ospho" (not supplied by Shade Systems - product of Skybryte Company, 3125 Perkins Avenue, Cleveland, OH 44114 – Tel.: 216-771-1590). Follow Skyco Ospho product directions as shown on its container. After Skyco application has completely dried, use the supplied touch up paint to match the color of your metal components.

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The Shade Systems CoolNet TM fabric has undergone several quality control checks prior to shipping to ensure it is in perfect condition. During installation, care must be taken not to damage the fabric as it can snag on hardware used on the frame and tear. Fabric packaging should not be opened with a knife to avoid cutting the fabric, and fabric should not be dragged on the ground.

For surface mount installations, posts are supplied with welded surface mount plate at one end with holes for anchoring hardware. Attach with 3/4" Hilti hardware as suggested in drawing (not supplied) with nuts and washers. Shim to achieve post plumbness.

SAFETY DURING INSTALLATION:

Before doing any excavation, the contractor shall confirm the location of all underground utilities.

Do not leave the job site unattended without making sure that fastening hardware on all equipment is tightened and cannot be moved. Especially where Shade System is being installed over playground equipment, recognize that unauthorized use of assembled or partially assembled playground equipment can lead to tampering with the incomplete Shade System and lead to injuries if these precautions have not been taken.

It is strongly recommended that the installation area is roped off with clearly marked warning signs posted during installation. Any unused footings should be covered with plywood or other suitable material if left unattended.

Contact the manufacturer at 1-800-609-6066 if you should have any questions regarding the proper installation.

SECTION 06 06 – POURED-IN-PLACE-RUBBER

06 06 01 DESCRIPTION

The Contractor shall purchase and install the poured in place surfacing. Contractor shall provide all necessary materials for manufacturers recommended installation process, and provide necessary labor and equipment to complete the site improvements as described herein and as shown on the drawings, which includes the following:

Poured in place rubber shall be installed to a depth as illustrated on the construction plans to meet the necessary impact attenuation for the fall height of the proposed play equipment. This surfacing shall be installed on a stone bed to the depth as illustrated with in the construction details.

06 06 02 MATERIALS

The poured in place rubber safety surfacing shall be as shown on the plans, as manufactured by Safety Turf Inc., or approved equal. The stone base material, geotextile fabric and poured surfacing aeriels shall strictly conform to manufacturer’s specifications as if written out in their entirety herein.

The safety surface shall be supplied in one standard color. - the designation of color areas to be provided to the contractor by the landscape architect at time of submittal review.

Poured Cushion Layer – A precise combination of recycled tire buffing mixed on site with a MDI based polyurethane binder. Depth of the cushion layer shall be per the performance requirements of ASTM-F1292.

SECTION 02000 – SITE WORK

Poured ½” Wear Course Layer – EPDM or TPV rubber granules (1-4mm size) and an MDI based polyurethane binder (Note: An Aliphatic Binder may be used if initial “yellowing” of light-colored EPDM or TPV granules is undesirable). Please consult the surfacing manufacturer for details.

Final color to be determined during the submittal process.

06 06 03 SUBBASE

- If the surface is existing (or new) asphalt or concrete, a not larger than a 1” deep by 1” wide keyway is to be cut into the surface along the perimeter of the safety surface area. This will provide for a stopping point for the beveled perimeter edge allowing for a barrier free accessibility.
- If asphalt or concrete is not used, then the subbase will be a compacted stone base. This base shall be prepared with a minimum of 4-6” of NJDOT 2B (3/4” clean) stone that is spread and compacted to a flat surface leaving the thickness of the required safety surface below finish level. Please note that a greater thickness of stone may be required if the existing material being removed is, for example, wood chips.
- Finished Grade: Verify that finished elevations of adjacent areas are as indicated on the drawings, that the appropriate sub-grade elevation has been established for the particular safety surface to be installed, and that the subsurface has been installed true, even plane, and sloped to drain as indicated on the drawings.

06 06 04 INSTALLATION

- Thickness – Total minimum depth of the safety surface will be 2”. The thickness may be adjusted to meet the fall height requirements noted in section 1.3 section A.
- Poured Cushion Layer – The cushion layer of recycled tire buffing will be mixed on site with an MDI based polyurethane binder in a mortar mixer. Mix buffing until they are coated uniformly. This layer will be poured in place by means of a screed and hand trowel at the thickness required to meet the performance requirements as referenced in ASTM-F1292. Edge conditions shall be per project requirements. The minimum temperature requirement for installation of the cushion layer is 40 degrees. Cure time increases at lower temperatures and humidity.
- Poured Wearing Course Layer – The 1/2” poured wearing course layer shall be composed of EPDM or TPV granular rubber. The EPDM or TPV rubber granules will be mixed on site with a MDI polyurethane binder in a mortar mixer. Mix granules until they are coated uniformly. The wearing course layer will be poured-in-place and hand trowel or rolled. If the safety matting is installed over existing asphalt or concrete, the EPDM or TPV granules will be troweled into the keyway to provide a smooth transition from the existing surface onto the safety matting. The minimum temperature requirement for installation of the wearing course layer is 50 degrees. Cure time increases at lower temperatures and humidity. Day seams may be required for areas greater than 2,000 square feet.
- Edges – Surface edges shall be flush with the edge of adjacent area, or be such that there is a smooth transition onto the safety matting from the existing surface, or per owner’s requirements.
- Porosity – Surface shall be porous to the extent of allowing the equivalent of 12” per hour of rainfall to flow through it.
- Traction – Surface shall be non-skid, wet or dry.
- Softness – Surface deflection with a 30 lb. Load shall be ¼” to ½” with 99% recovery.
- Health & Environment After Curing – Surface shall be non-toxic, non-allergenic and non-polluting.

06 06 05 CLEANING:

Upon completion of installation of the safety surfacing, clean all work areas of PIP materials and trash.

06 06 06 PROTECTION:

SECTION 02000 – SITE WORK

The safety surface should be protected from foot traffic for a minimum of 24 hours after installation to allow surface to cure. (Note: This curing time may be longer in colder weather.)

06 06 07 METHODS OF CONSTRUCTION

The play area surfacing shall be located as shown on the drawings and installed in strict conformance with the manufacturer's recommendations, by a contractor certified by the manufacturer. Upon completion, all surfacing shall comply with all applicable State, Federal, and International safety codes, and as required by the manufacturer.

Contractor shall provide shop drawing to Landscape Architect of attachment for approval prior to installation.

When fully installed, surfacing shall be level and drain, firmly attached, secure and free of any play whatsoever.

Contractor to provide a third-party for certified testing of the impact attenuation of the poured in place surface within 30 days of installation.

SECTION 06 07 – PLAY EQUIPMENT

06 07 01 DESCRIPTION

The Contractor shall purchase and install playground equipment and shade structure. Contractor shall provide all necessary materials for manufactures recommended installation process, and provide necessary labor and equipment to complete the site improvements as described herein and as shown on the drawings, which includes the following:

The playground equipment shall be manufactured by Landscape Structures or approved equal. The contractor shall install the equipment in the locations as shown on the plans. The structures shall include all play elements and features as identified on the plans.

The contractor shall supply and design concrete footings and any additional necessary items for the installation of the Play Equipment as per the manufacturer's specifications. Design of the playground footings shall be prepared as a Contractor Delegated Design submittal prepared by a Licensed New Jersey Professional Engineer in good standing.

06 07 02 METHODS OF CONSTRUCTION

Copies of manufacturer's latest published product data for materials specified in this Section shall be submitted to the Engineer for review. No materials are to be delivered to the site prior to review. All manufacturer's Specifications are included herein by reference, as if written out in their entirety.

All work must be done by a single firm specializing in the work and shall be a certified installer by the manufacturer.

All materials shall be delivered to the site in original unopened containers clearly indicating the manufacturer's name, brand name, and other identifying information.

Materials shall be stored in a dry location, off the ground, and in such a manner as to prevent damage or intrusion of foreign matter.

All materials which have become damaged or otherwise unfit for use, during delivery or storage shall be replaced at the expense of the Contractor.

SECTION 02000 – SITE WORK

Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.

Grade stakes shall be maintained until removal is mutually agreed upon by all parties concerned.

Do not commence work until all utility lines, backfilling and grading has been completed. All work items must be properly coordinated with pavement installation.

Keep pavements clean and work area in an orderly condition.

Protect all work and materials from damage due to operations by other contractors, trades and trespassers.

Repair or replace damaged materials as directed by the Architect and/or Engineer.

When work is completed, including maintenance, Architect and/or Engineer will, upon request, make an inspection to determine acceptability.

Work may be inspected for acceptance in parts agreeable to the Architect and/or Engineer, provided work offered for inspection is complete.

When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect and/or Engineer for re-inspection until the area is found to be acceptable. Remove rejected materials promptly from project site.

The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than two (2) years from the date of final acceptance by the Engineer and Landscape Architect.

06 07 03 INSTALLATION

The play equipment shall be installed in strict conformance with the manufacturer's recommendations, by a contractor certified by the manufacturer. Upon completion, all equipment shall comply with all applicable State, Federal, and International safety codes, and as required by the manufacturer. Contractor shall provide engineer or architect with certification from the manufacturer that all equipment was installed in accordance with the manufacturers specifications and complies with the aforementioned codes.

Contractor shall provide shop drawing to Landscape Architect/Engineer of attachment for approval prior to installation.

When fully installed, structures shall be level, firmly attached, secure and free of any play whatsoever.

All connectors shall be firmly tightened, and structures shall be free of any marks, dents, holes, etc. resulting from transportation to the site and actual on-site construction.

SECTION 06 08 - BOLLARD

06 08 01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and the General Requirements, apply to work of this section.

06 08 02 SCOPE OF WORK

SECTION 02000 – SITE WORK

A. The Contractor shall supply all equipment, materials and labor to complete the site improvements as described herein and as shown on the drawings, which includes the following:

1. BOLLARD
2. REMOVEABLE BOLLARD

06 08 03 RELATED SECTIONS

- A. Earthwork
- B. Pavements
- C. Site Concrete
- D. Signs

06 08 04 SUBMITTALS

- A. Certification
 1. General
 - a. Certificates of inspection as required by governmental authorities.
 - b. Other data substantiating that materials comply with specified requirements.
- B. Samples as required in PART 2 - PRODUCTS
- C. Shop Drawings - As required in PART 3 - EXECUTION
- D. Product Data
 1. Copies of manufacturer's latest published product data for materials specified in this Section shall be submitted to the Engineer or Architect for review. No materials are to be delivered to the site prior to review. All manufacturer's Specifications are included herein by reference, as if written out in their entirety.

06 08 05 SUBSTITUTIONS

- A. The Contractor shall submit a base bid as per plan.
 1. It is the Contractor's responsibility to make every reasonable effort to find the material specified.
- B. It is the intent to eliminate post - bid substitutions.
- C. In the event that the contract material has become unavailable, the Contractor may offer substitutions to the Engineer or Architect for consideration. If he does so, he must include price clarification for such substitutions. Any substitution must be approved in writing by the Engineer or Architect.

06 08 06 QUALITY ASSURANCE

- A. Work under this section must be done by a single firm specializing in the work.

06 08 07 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the site in original unopened containers clearly indicating manufacturer's name, brand name, and other identifying information.

SECTION 02000 – SITE WORK

- B. Materials shall be stored in a dry location, off the ground, and in such a manner as to prevent damage or intrusion of foreign matter.
- C. All materials which have become damaged or otherwise unfit for use, during delivery or storage shall be replaced at the expense of the Contractor.

06 08 08 PROJECT CONDITIONS

- A. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- B. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- C. Do not clear, excavate, or construct any items until after all utility lines, backfilling and grading has been completed. Fences and gates must be properly coordinated with pavement installation.
- D. Clean-up and Protection
 1. Keep pavements and surfaces clean and work area in an orderly condition.
 2. Protect all work and materials from damage due to operations by other contractors, trades and trespassers.
 3. Repair or replace damaged materials as directed by the Engineer or Architect.

06 08 09 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, Engineer or Architect will, upon request, make an inspection to determine acceptability.
- B. Work may be inspected for acceptance in parts agreeable to the Engineer or Architect, provided work offered for inspection is complete.
- C. When inspected work does not comply with requirements, replace rejected work and apply to the Engineer or Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

06 08 10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than two (2) years from the date of final acceptance by the Engineer or Architect.

PART 2 – PRODUCTS

06 08 11 BOLLARDS

- A. 6" (6.625" O.D.) Schedule 40 Pipe as fabricated by Ideal Shield or approved equal.
2525 CLARK ST. DETRIOT, MI 48209
1.866.825.8659
WWW.IDEALSHIELD.COM
 1. Finish shall be galvanized.
 2. Wall thickness shall be .28" or greater.

SECTION 02000 – SITE WORK

3. Length shall be as specified on the plans
- B. Bollard Sleeve shall be a (1/4") 6" Reflective Bollard Cover as fabricated by Ideal Shield or approved equal.
2525 CLARK ST. DETRIOT, MI 48209
1.866.825.8659
WWW.IDEALSHIELD.COM
 1. Final color to be determined and shall be selected from the manufacturer's standard colors.
 2. Cover shall have a wall thickness of a minimum .25"
 3. Cover shall be domed.
 4. Each Sleeve shall include silver reflective tape.
- C. Removal Bollard shall be a 6" Removable Locking Bollard, product number REM LOK-06-GALV, as fabricated by Ideal Shield or approved equal.
2525 CLARK ST. DETRIOT, MI 48209
1.866.825.8659
WWW.IDEALSHIELD.COM
 1. Finish shall be galvanized.
 2. Cover shall have a wall thickness of a minimum .125"
 3. Cover shall be domed.
 4. Each Sleeve shall include silver reflective tape.
 5. Final color to be determined and shall be selected from the manufacturer's standard colors.

PART 3 – EXECUTION

06 08 12 BOLLARD

- A. Bollard shall be installed as per manufacturer's specifications and shall be set plumb.
- B. Bollard shall be filled with concrete.
- C. Any exposed concrete from the footing shall have a smooth and clean wood float finish.
- D. The concrete shall be sloped away from the bollard.
- E. Bollard sleeve shall be securely fashioned to the steel bollard.
- F. Where the bollards are to receive accessible parking signs. Contractor shall cut bollard sleeve in a manner to receive the breakaway post.

DIVISION 07, LANDSCAPING

SECTION 07 01 – TOPSOIL AND SEED

07 01 01 DESCRIPTION

Topsoil and Seed shall include the furnishing and placing of a four (4") inch thick bed of topsoil, seeding and fertilization of all disturbed areas and in locations as identified on the plans and other matter as herein specified, in the quantities required in accordance with the Plans and Specifications.

The Contractor shall guarantee all seeding installed under this Contract for a period of two (2) years after the Engineer's Final Acceptance of all seeding, at no additional cost to the Owner.

The Contractor shall replace or overseed any Seed that is dead or have failed to thrive, whether due to natural causes or vandalism, or that are, in the opinion of the Engineer or Landscape Architect, unhealthy, unsightly, or inadequate or improper maintenance. All the above mentioned material will be removed by the Contractor within ten (10) days of notification by the Engineer or Landscape Architect.

07 01 02 MATERIALS

Topsoil

Topsoil, existing or imported, shall have been tested by a certified independent soil testing laboratory. A laboratory test shall be included for each source of topsoil. These test results shall be submitted to the Engineer for review and approval prior to importing the topsoil.

The topsoil test shall determine the presence of a minimum of the following:

- 1.) Phosphorous
- 2.) Potassium
- 3.) Magnesium
- 4.) Calcium
- 5.) Sodium
- 6.) Nitrate - Nitrogen
- 7.) Sulfur
- 8.) Zinc
- 9.) Manganese
- 10.) Copper
- 11.) Iron
- 12.) Boron
- 13.) % organic matter (by rapid dichromatic oxidation)
- 14.) Soil pH
- 15.) Buffer pH (if pH < 6.4)
- 16.) Excess carbonate (if pH > 6.4)
- 17.) Soluble salts (electrical conductivity)
- 18.) Cation Exchange Capacity (CEC)
- 19.) Percent base saturation
- 20.) Mechanical analysis (sand, silt and clay content)
(as determined by the Buoyoucos Hydrometric Method)

Topsoil shall contain at least 3% organic matter determined by loss on ignition of moisture free samples. The acidity range shall be pH 5.0 to 7.0 inclusive. The mechanical analysis of the soil shall be:

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Passing	Retained On	Percentage
# Sieve Analysis	mm	% Volume
#10 Gravel	(>2.0mm)	<6%
#18 Very Coarse Sand	(2.0 - 1.0mm)	
#35 Coarse Sand	(1.0 - 0.5mm)	
#60 Medium Sand	(0.5 - 0.25mm)	45 - 75
#140 Fine Sand	(0.25 - 0.10mm)	
#200 Very Fine Sand	(0.10 - 0.05mm)	
Silt	(0.05 - 0.002mm)	5 - 25
Clay	(<0.002mm)	5 – 20
	clay in equal proportion)	

All topsoil, both newly furnished and stockpiled (if any), shall be natural topsoil, sandy loam (max. 65% sand, per USDA soil textural triangle) free from subsoil, and obtained from an area which has never been stripped. Topsoil shall be of uniform quality, free from hard clods, stiff clay, hard pan, stones larger than 1/2", lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, sticks or any other undesirable material.

Topsoil must also be free of plants or plant parts of Bermudagrass, Quackgrass, Johnsongrass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, etc..

Topsoil shall not contain toxic substances harmful to plant growth, i.e. pesticide residues and shall comply with NJDEP Site Remediation Program standards for "Clean" soil.

No topsoil shall be shredded, screened, mixed or worked in a wet or frozen state.

Submit sample of topsoil along with Certified Soil Test Analysis for acceptance prior to transport of topsoil to site. Location of topsoil source shall be provided.

Topsoil which has been stripped from the site of the work may be used for planting provided it meets this specification and is tested and treated in accordance therewith. All topsoil required in excess of that obtained from the site shall be furnished by the Contractor. Use of onsite material shall in no way relieve the Contractor from the requirements of the Specification and the performance guarantee.

All Topsoil, Imported utilized on site shall be thoroughly blended with existing topsoil.

Delivery of any Topsoil, Imported in a very wet or frozen condition will not be accepted.

Delivery of the topsoil, Imported to the site shall be monitored by the Engineer to determine conformance to the specifications. At the direction of the Engineer, and Topsoil, Imported, which does not conform to the Specifications, shall be rejected, removed and replaced with the specified Topsoil, Borrow at the Contractor's expense.

Soil Amendments

Applications of the following amendments shall be determined by the soil test recommendations and in seeded areas only.

Lime: Material shall be ground or pulverized limestone which contains at least 50% total oxides, i.e. calcium oxide plus magnesium oxide. Limestone shall be ground to such fineness that at least 50% will pass through a 100-mesh sieve and 98-100% will pass through a 20-mesh sieve. Granular or pelletized lime may be used but it must follow the same specifications as above prior to being granulated or pelletized. Applications shall be determined by soil test recommendations and in seeded areas only.

Aluminum Sulfate: Commercial grade.

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Peat Moss: Type 1 sphagnum peat moss; finely divided with a pH of 3.1 to 5.0.

Sedge Peat: Decomposed peat containing no identifiable fibers.

Leaf Compost: Screened and free of trash.

Pine Bark: Potting grade pine bark with no particle size larger than 1/2" and less than 10% wood fiber.

Bone Meal: Finely ground and with a minimum analysis of 2% nitrogen and 20% available phosphoric acid.

Sand: Clean washed sand free of toxic materials.

Perlite: Conforming to the National Bureau of Standards PS 23.

Vermiculite: Horticultural grade, free of toxic substances.

Sawdust: Rotted sawdust, free of chips, stones, sticks soil or toxic substances and with 7.5 pounds nitrogen uniformly mixed into each cubic yard of sawdust.

Manure: Well rotted, unleached stable or cattle manure containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

Commercial Fertilizer

Contractor to provide Manufacturer's or vendor's certified analysis of fertilizer materials.

All fertilizer shall be granular pills, packets, pellets or liquid with 35% to 80% of the total nitrogen in a slow-release form, formulated for mixing into soils, and certified by the manufacturer to provide controlled release of nitrogen continuously for a period of no more than 12 months. Commercial fertilizer must be consistent with, and be applied in accordance with, Federal and State fertilizer laws.

All fertilizers shall be uniform in composition, free flowing and suitable for application with approved equipment. Fertilizers shall be delivered to the site fully labeled according to applicable State fertilizer laws and shall bear the name, trade name or trademark, and warranty of the producer and furnished to the Engineer at the time of delivery. Application rates and ratios shall be determined by soil test recommendations.

Weed Control

Any herbicide used must be approved by Federal and State Authorities for use in this area.

Contractor shall submit brand name and content of broad-leafed herbicide to be used to Engineer for approval prior to any weed control applications.

Application rates shall be as appropriate for amount of weed control required and shall be as per manufacturer's recommendations.

Contractor shall post warning flags in all areas treated with weed control.

Application shall not occur during times when the general public might be subject to exposure.

Seed

Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by the Official Seed Analysts of North America.

SECTION 02000 – SITE WORK

Seed shall match the composition of the “Tuckahoe Athletic Fescue Turf” sod mix as supplied by Tuckahoe Turf Farms, or approved equal, seed mix is as follows:

SEED MIXTURE

30% Penn RK4 Turf Type Fescue
30% Rebel IV Turf Type Tall Fescue
30% Justice Turf Type Tall Fescue
5% Wildwood Kentucky Bluegrass
5% Brooklawn Kentucky Bluegrass

Each shipment of the grass seed shall be accompanied by an analysis of its composition, purity and germination, certified by the seed house, and furnished to the Engineer at the time of delivery for his approval. A submittal outlining the precise seed varieties, manufacturer and seed ratings are to be submitted at the start of construction.

Mulch

Mulch for Seeded Areas

Straw shall be free of rot, mildew, noxious weed seeds and shall be small-grained, such as wheat or barley.

Cellulose fiber mulch shall consist of specially prepared cellulose processed into a uniform fibrous physical state. The fiber mulch, including dye, shall contain no germination or growth inhibiting factors. The mulch material shall be manufactured and processed in such a manner that the cellulose fiber mulch will remain in uniform suspension in water under agitation and will blend with seed, fertilizer and other additives to form a homogeneous slurry. The mulch shall cover and hold seed in contact with the soil without inhibiting the growth of seedlings.

Prefabricated wood shaving mat shall be woven and may contain light weight plastic netting on one or both sides.

Stabilizing Materials

Mulch anchoring tool is a tractor-drawn implement designed to punch and anchor mulch into the soil surface a minimum of 2".

Cellulose fiber may be used for anchoring straw. The fiber binding shall be applied at a net dry weight of 750 pounds per acre. The cellulose fiber may be mixed with water. The mixture shall contain a maximum of 50 pounds of cellulose fiber per 100 gallons of water.

Liquid Mulch Binder

Binder shall be non-asphaltic liquid concentrate diluted with water forming a transparent, 3-dimensional, film-like crust permeable to air and water and containing no agents toxic to seed germination.

Applications of liquid mulch binder shall be heavier at the edges of mulched areas where wind catches the mulch.

Liquid mulch binder shall be applied uniformly at a rate of 6 gal./ac.

Mulch Netting: Stake light weight plastic netting over the mulch according to manufacturer's recommendations. Stakes shall be driven to ground level or removed once seed is established.

Water

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Shall be provided at the Contractors expense and shall be applied in accordance with these specifications. If a source of water is available onsite, contractor must request permission from owner or engineer prior to use of existing water source on-site.

07 01 03 METHOD OF CONSTRUCTION

Excavation and grading shall be done in conformance with Division 2, Sections 3, 3a, 8, or 16 as applicable of the Specifications.

Scarify the area to be topsoiled to improve the bond between slope and topsoil. Remove from the scarified area stones 2 inches or larger in any dimension and other debris such as wires, cables, tree roots, pieces of concrete, clods, and lumps. For slopes of 2H:1V or steeper, create ridges (such as by a dozer track) in the subsoil surface parallel to the bottom of the slope.

All valve boxes, curb stops, cleanouts, vents and miscellaneous castings and appurtenances shall be set to finish grade prior to placing topsoil. All areas shall be brought to final grade with the required amount of topsoil.

Ensure that ground areas are not damaged by the delivery, handling, or storage of materials; by washouts due to drainage diversion; by workers; or by equipment. Repair such damage by grading, fertilizing, seeding, and mulching as specified in accordance with the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation 806.03.01.

Two samples (minimum) shall be provided for every acre. Results of the tests shall be furnished by the Contractor to the Engineer prior to commencement of seeding. All additives necessary to meet the topsoil requirements shall be added in a manner satisfactory to the Engineer.

Spreading of Topsoil

After the Engineer has approved the prepared surface elevations, spread topsoil and smooth to grade to produce the required thickness. For slopes of 2H: 1V or steeper, create ridges (such as by a dozer track) in the topsoil surface parallel to the bottom of the slope to hold the seed in place and to retain moisture.

A minimum of 6" of topsoil shall be spread or respread over prepared subgrade.

Spread topsoil to the minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. Add specified soil amendments based upon the certified lab test results and mix (by disc or other mechanical means) thoroughly into the topsoil.

Spreading of topsoil shall be performed in such a manner that seeding can proceed with a minimum of additional soil preparation and tillage.

Any irregularities in the surface resulting from topsoiling or other operations shall be corrected in order to prevent the formation of depressions or water pockets.

Topsoil shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or in any condition that may otherwise be detrimental to proper grading and/or seeding.

If topsoil is not being installed immediately storage of Topsoil shall be performed in accordance with the 2019 Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation section 202.03.03B.

Fine Grading

Fine grade **areas** to smooth even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions as required to meet finished grades, and provide positive drainage as directed in the field by the Landscape Architect. Limit fine grading to areas which can be planted immediately after grading.

SECTION 02000 – SITE WORK

Seeding work shall proceed only after rough grading has been completed and the finish grade is within ¼” of the final finish grade.

Preparation of Unchanged Grades for Lawn

Where **LAWN** is to be planted in areas that have not been altered or disrupted by excavating, grading or stripping operations, prepare soil for planting as follows:

Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material properly; do not turn over into soil being prepared for lawns.

Till soil to a depth of 6" and apply soil amendments as recommended by soil test analysis. Remove high areas, fill in depressions and till soil to a homogeneous mixture of fine texture, free of lumps, clods, stones over 1/2", roots and other extraneous matter.

Apply commercial fertilizer at rates recommended by the certified lab test results and thoroughly mix into top 4" of soil. Delay application of fertilizer if lawn planting will not follow within a few days.

The appropriate fertilizer shall be thoroughly mixed into the topsoil areas to be seeded at the rate and type established by the certified soil test. The lawn areas shall then be carefully raked and brought to an even smooth grade, and made ready for seeding.

Delay application of fertilizer if lawn planting will not follow within a few days. All stones, debris or vegetation 1" or more in diameter brought to the surface shall be collected and removed by the Contractor. The finished grade shall be even, smooth and free of any depressions or mounds.

Seeding New Lawns

Preparation of Subgrade

Work shall proceed only after rough grading has been completed and the subgrade is within 1/10 of 1' (1.25”) of the final subgrade elevation.

If the subgrade area develops volunteer weed growth, the growth must be eliminated at this phase with glyphosate- 2 treatments, 4 weeks apart.

Grades which have been previously established in conformance with the drawings shall be maintained in a true and even grade.

Loosen subgrade of the areas to a minimum depth of 6". Remove all stones over 1", sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation. Subgrade shall be inspected and approved by the Engineer after tilling and prior to any spreading of topsoil.

Limestone shall be spread and worked into the subsoil at an application rate determined by soil test analysis. Through use of a rototiller or an approved cultivator, any lime spread over the surface shall be worked into the top 4" to 6" of topsoil.

Initial Seeding Procedures for lawn areas- (Broadcast seeding will not be permitted.)

Prior to seeding operations, the Engineer shall inspect and approve final grading and topsoil preparation.

If and where directed by the engineer, apply Glyphosate type as directed on label and at appropriate concentrations to kill existing undesirable vegetation.

After the above is completed and approved by the Engineer, the area shall be seeded at a rate of six (6) pounds per thousand (1000) square feet. Seeding operations shall be performed between March 15 and May 15 or between

SECTION 02000 – SITE WORK

August 15th and September 30. The seeding time frame may be extended or reduced according to the prevailing weather conditions, Engineers approval and/or per the grower's recommendations. Seeding shall not be performed on frozen ground or when temperature is 32 degrees or colder.

No seeding shall be permitted after a rain (unless surface of ground is loosened) or when the velocity of the wind exceeds 5 MPH. Extreme care shall be exercised during seeding and raking so that no change in grade is made and so that seed is not raked from one area to another.

Sow lawn seed using a slit seeder or drill seeder. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to one another. Hydroseeding will be permitted by the Engineer or Landscape Architect

Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage. Moisten prepared areas before planting, if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create muddy soil condition.

Sow not less than the quantity of seed specified or scheduled.

Protect seeded LAWN against erosion by spreading mulching material after completion of seeding operations. Spread uniformly to form a continuous blanket of not less than 1 1/2" loose measurement over seeded areas.

Newly seeded areas shall be lightly rolled with a two hundred pound hand roller. The completed area shall have a smooth even appearance.

Protect seeded slopes against erosion with erosion netting or other methods acceptable to the Engineer.

Anchor mulch with stabilizing material. Take precautions to prevent damage, or staining, of construction or other plantings adjacent to mulched areas.

In the absence of rain, the newly seeded areas shall be watered 2-3 times daily at 10:00 a.m., 12:00 p.m. and/or 2:00 p.m.

If the area develops volunteer weed growth, the growth must be eliminated at this phase with glyphosate- 2 treatments, 4 weeks apart.

Grades which have been previously established in conformance with the drawings shall be maintained in a true and even grade.

07 01 04 MAINTENANCE OF SEEDED AREAS

The Contractor shall be responsible for the continued maintenance of the seeded lawn areas and shall not be considered for Final Acceptance until a full vigorous stand of turf exists, final overseeding has germinated and at least three (3) successful mowings have been conducted. Re-working and re-seeding with the same seed mixture applied at the same rate as originally specified, of any area which fails to show a uniform stand of grass, shall be repeated, at the Contractor's expense, until all areas are covered with a satisfactory stand of grass, and the lawn is accepted. The following activities are to be continuous until the time of Final Acceptance, and shall include, but not be limited to:

General Seeded Lawn Area Maintenance

- Proper and adequate watering
- Re-filling of rain-washed gullies and rutted areas
- Re-fertilization and lime applications as recommended by soil test analysis
- Weed, fungus and pest control

SECTION 02000 – SITE WORK

The Contractor's responsibilities for maintenance of **seeded areas** shall include, but not be limited to, the following:

- Re-seeding of any bare areas
- If seeded in the fall, or if not acceptable at that time, continue maintenance the following spring until acceptable lawn is established.
- Apply subsequent fertilizer applications as recommended by soils test analysis.
- Re-fertilization and lime applications as recommended by soil test analysis
- If seeded in the fall, or if not acceptable at that time, continue maintenance the following spring until acceptable lawn is established.
- Mowing and Miscellaneous Maintenance of Seeded Lawn Areas
- Mow to a height of 2" - 3" when grass attains a height of 4" or when growth tends to smother new seedlings. Do not remove more than 1/3 of the blade of grass at any one time.
- Mowing operations shall include trimming around all obstacles, raking excessive grass clippings and removing debris from walks, curbs and parking areas. String trimmers shall not be used around plant material.
- Edging of all sidewalks, curbs and other paved areas, as well as the limit of seed edge, shall be performed once every other mowing. Debris from edging operations shall be removed and the areas swept clean.
- **Maintenance Period for Seeded Lawn Areas** - The maintenance period shall extend for 60 days after Final Acceptance, while turf is actively growing. This shall include not less than eight (8) weekly mowing

SECTION 07 02 – PLANTING

07 02 01 DESCRIPTION

Planting shall include the furnishing, preparation of beds and pits and installation of all landscape materials and other matter as herein specified, in the quantities required, and in accordance with the Plans and Specifications.

The Contractor shall guarantee all plant material installed under this Contract for a period of two (2) years after the Landscape Architects/Engineers final acceptance of all planting at no additional cost to the Owner.

07 02 02 GENERAL

All plant material shall meet or, if indicated on the plant list, exceed the standards set forth in the current issue of American Standard for Nursery Stock published by the American Horticulture Industry Association (ANSI-Z60.1). Height, spread and caliper sizes shall be as indicated on the plant list. All plants shall equal or exceed measurements specified in the plant list which are the minimum acceptable.

Nomenclature will be in accordance with Hortus III by L.H. Bailey.

Contractor shall perform topsoil testing in accordance with Division 7, Section 1, submit results to Landscape Architect/Engineer for review.

Submittals shall be provided for all manufactured items including but not limited to; fertilizer, herbicide, Mycorrhizal Fungal Inoculant, Mulch, Peat moss, All other soil amendments, as determined by soil testing.

Prior to the commencement of work, the contractor shall provide the Landscape Architect or Engineer with an itemized schedule of values for each of the various types of plant materials, to serve as a basis for any substitutions, additions, deletions, etc.

SECTION 02000 – SITE WORK

It is the Contractor's responsibility to make every reasonable effort to find the material specified. The Contractor shall furnish quantities necessary to complete the planting as shown on the plans.

In the event that the contract material has become unavailable, the Contractor may offer substitutions to the Landscape Architect or Engineer for consideration. If he does so, he must include price clarification for such substitutions. Any substitution must be approved in writing by the Engineer or Landscape Architect.

07 02 03 QUALITY ASSURANCE

Landscape work must be done by a single firm specializing in landscape work.

Source Quality Control

General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.

Analysis and Standards (Topsoil Amendments): Package standard product with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

Trees, Shrubs and Other Plant Material

Contractor shall provide healthy, vigorous stock grown in a recognized nursery in accordance with good horticultural practice and free of disease, insects, larvae, eggs and defects such as knots, sunscald, injuries, abrasions or disfigurement.

All plant material shall come from sources within the same USDA / Agricultural Research Service Plant Hardiness Zone as the Project Site and within 200 miles of the Project Site. Any material from sources outside this zone is not acceptable.

Balled and burlapped plants shall be dug with firm rootballs free of noxious weeds. There shall be no excess soil on the top of the rootball or around the trunk.

Rootball sizes shall be accordance with American Standard for Nursery Stock unless specifically noted.

Container grown stock shall be used only when specified and shall conform to standard set forth in with the standards set forth by these specifications.

At least 10% of each variety of trees and shrubs shall be labeled with a securely attached, waterproof tag bearing legible designation of botanical and common name.

Caliper and Height Measurement of Balled and Burlapped Material

In size grading of single trunk trees, caliper shall take precedence over height.

Caliper of trunk shall be taken at 6" above the ground level for trees up to and including 4" caliper size, and 12" above the ground level for larger trees.

For multi-stemmed trees, at least one trunk must meet caliper size.

In all cases, Contractor shall make every effort to meet both caliper and height standards specified on the plans and in the schedules.

Container Grown Stock

The size of container grown shrubs shall be measured by the height and width of the plant.

SECTION 02000 – SITE WORK

Container grown trees shall be measured by the same standards as listed above.

Herbaceous perennials shall be measured by pot size, not top growth.

The root system of container grown plants shall be well developed and well distributed throughout the container such that the roots visibly extend to the inside face of the container.

Plants shall be measured before pruning with branches in normal position. Necessary pruning shall be done at time of planting.

When formal arrangements or consecutive order of trees or shrubs is shown, stock shall be selected for uniform height and spread and labeled by number to assure symmetry in planting.

When all plant material has been selected and pre-tagged by the Landscape Contractor, the Landscape Architect or Engineer shall be notified in order to schedule his nursery inspection with a minimum of 3 days advance notice.

The Contractor shall accompany the Landscape Architect or Engineer on all inspections.

The Contractor shall have located sufficient alternate choices to prevent loss of time in the event that some trees fail to meet with the approval of the Landscape Architect.

All trees must be approved in the field by the Landscape Architect or Engineer before digging begins.

Field collected plant material shall not be used unless nursery grown stock is not available, and then only when authorized in writing by the Landscape Architect/Engineer. Collected stock shall have rootballs in accordance with (ANSI-Z60.1).

07 02 04 DELIVERY, STORAGE AND HANDLING

Deliver packaged materials in containers bearing weight, analysis and name of manufacturer.

Protect materials from deterioration during delivery and while stored at the site.

Trees and Shrubs

The Contractor shall provide freshly dug plant material.

Trees and shrubs shall not be bent or tied in such a manner as to damage bark, break branches or destroy natural shape. Damaged material will be rejected.

Protective covering shall be provided during delivery.

Roots of bare root material shall be protected during delivery and handling to guard against drying out and damage.

Bare root plants, if specified, shall be puddled immediately after digging by immersing the roots in a thick mixture of clay and water so as to completely coat the roots.

If planting is delayed for more than 5 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. All container grown plants shall be grouped and watered daily until planting. Deliver trees and shrubs after preparations for planting have been completed, and plant immediately.

Do not remove container grown stock from containers until planting time.

The Contractor shall, in loading and unloading or handling plants, exercise the utmost care to prevent

SECTION 02000 – SITE WORK

injuries to the branches or roots.

The solidity of the rootball shall be carefully preserved. Plants delivered with broken rootballs will be rejected.

07 02 05 PROJECT CONDITIONS

Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete, landscape work as rapidly as portions of the site become available (working within seasonal limitations for each kind of landscape work required).

Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, excavating by hand if required.

When conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions or obstructions etc., the Contractor shall notify the Landscape Architect or Engineer immediately.

Should planting of trees and shrubs occur after lawn work, lawn areas shall be protected and damage to lawns resulting from planting operations shall be promptly repaired.

During landscape work keep pavements clean and work area in an orderly condition.

Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers.

Treat, repair or replace damaged landscape work as directed by Landscape Architect/Engineer.

07 02 06 INSPECTION AND ACCEPTANCE

When landscape work is completed, including maintenance, Engineer and Landscape Architect will, upon request, make an inspection to determine acceptability.

Landscape work may be inspected for acceptance in parts agreeable to Landscape Architect and Engineer, provided work offered for inspection is complete, including maintenance.

When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect/Engineer and found to be acceptable. Remove rejected plantings and materials promptly from project site.

The Contractor shall replace any trees, shrubs or plants that are dead or that are, in the opinion of the Landscape Architect or Engineer, unhealthy, unsightly or have lost their design value or natural shape because of dead branches, excessive pruning, or inadequate or improper maintenance. All the above mentioned material will be removed immediately upon direction of the Landscape Architect or Engineer and replacement planting is to be done no later than the succeeding season.

07 02 07 MATERIALS

Plant Materials

Provide deciduous tree of height and caliper scheduled or shown and with branching configuration recommended by ANSI-Z60.1 for type and species indicated.

Provide single stem trees except where otherwise specified.

Provide balled and burlapped material unless otherwise specified.

SECTION 02000 – SITE WORK

Provide shrubs of height and/or spread scheduled or shown and with not less than the minimum number of canes required by ANSI-Z60.1 for type and height indicated.

Provide balled and burlapped material unless otherwise indicated.

Provide Coniferous and Broadleafed Evergreens of sizes scheduled or shown and which meets or exceeds ANSI-Z60.1 standards.

Dimensions specified indicate minimum spread for spreading and semi-spreading type evergreens, and height for other types of evergreens such as globe, cone, dwarf, pyramidal, broad upright and columnar.

Provide quality evergreens with well balanced form complying with requirements for other size relationships to the primary dimension indicated.

Provide balled and burlapped material unless otherwise indicated.

Provide container grown (Ornamental Grasses and Perennials) material conforming to ANSI-Z60.1 specification for container grown stock.

Planting Backfill Mixture

Planting backfill mixture shall be the existing native topsoil, or 'A' Horizon.

If existing native topsoil is determined to be unsuitable, an approved imported topsoil with similar soil characteristics to the native topsoil may be used, if and where directed by Landscape Architect. Contractor shall provide Certified Soil Analysis of imported topsoil for review and approval. Unsuitable excavated material is to be removed from the site and disposed of at the Contractor's sole expense.

Topsoil mixture for backfilling planted areas shall consist of five (5) parts by volume of topsoil thoroughly mixed with one (1) part of peat moss or humus. The planting backfill mixture shall be thoroughly mixed by hand or rotary mixer to the satisfaction of the Landscape Architect or Engineer or his representative.

Mycorrhizal inoculants shall be added to all planting backfill in granular, powder or liquid form. The species formulation used in the inoculant shall be diverse and have been proven to be effective over wide ranges of plant species, pH, and soil types. It shall be applied according to the manufacturer's recommendations.

Soil Amendments

- A. Lime: Material shall be ground or pulverized limestone which contains at least 50% total oxides, i.e. calcium oxide plus magnesium oxide. Limestone shall be ground to such fineness that at least 50% will pass through a 100-mesh sieve and 98-100% will pass through a 20-mesh sieve. Granular or pelletized lime may be used but it must follow the same specifications as above prior to being granulated or pelletized. Applications shall be determined by soil test recommendations.
- B. Aluminum Sulfate: Commercial grade.
- C. Peat Moss: Type 1 sphagnum peat moss; finely divided with a pH of 3.1 to 5.0.
- D. Sedge Peat: Decomposed peat containing no identifiable fibers.
- E. Leaf Compost: Screened and free of trash.
- F. Pine Bark: Potting grade pine bark with no particle size larger than 1/2" and less than 10% wood fiber.
- G. Bone Meal: Finely ground and with a minimum analysis of 2% nitrogen and 20% available phosphoric acid.

SECTION 02000 – SITE WORK

- H. Sand: Clean washed sand free of toxic materials.
- I. Perlite: Conforming to the National Bureau of Standards PS 23.
- J. Vermiculite: Horticultural grade, free of toxic substances.
- K. Sawdust: Rotted sawdust, free of chips, stones, sticks soil or toxic substances and with 7.5 pounds nitrogen uniformly mixed into each cubic yard of sawdust.
- L. Manure: Well rotted, unbleached stable or cattle manure containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

Fertilizer

Commercial fertilizer must be consistent with, and be applied in accordance with, Federal and State fertilizer laws. All fertilizer shall be granular pills, packets, pellets or liquid with 35% to 80% of the total nitrogen in a slow release form, formulated for mixing into soils, and certified by the manufacturer to provide controlled release of nitrogen continuously for a period of no more than 12 months.

For trees and shrubs: Fertilizer shall be a complete fertilizer with a minimum analysis of 10% nitrogen, 6% phosphorous and 4% potassium. Fertilizers with a ratio of 4-1-2 (i.e. 24% nitrogen, 6% phosphorous and 12% potassium) shall be used for woody plants. Available product include but are not limited to: Forikote, NPK 18-6-12, as manufactured by Florikan; Sustane + Sumicoat, 16-4-8, as manufactured by Sustane Natural Fertilizer, Inc.; or approved equal.

For perennials, annuals and bulbs: Fertilizer shall be a complete fertilizer that is slow released.

All fertilizers shall be uniform in composition, free flowing and suitable for application with approved equipment. Fertilizers shall be delivered to the site fully labeled according to applicable State fertilizer laws and shall bear the name, trade name or trade mark, and warranty of the producer. Application rates shall be determined by soil test recommendations.

Weed Control

Any herbicide used must be approved by Federal and State Authorities for use in this area.

Contractor shall submit brand name and content of broad-leafed herbicide to be used to Landscape Architect or Engineer for approval prior to any weed control applications.

Application rates shall be as appropriate for amount of weed control required and shall be as per manufacturer's recommendations.

Contractor shall post warning flags in all areas treated with weed control.

Application shall not occur during times when the general public might be subject to exposure.

Mulch

Material shall be composted, shredded hardwood (or pine bark with less than 10% sapwood), dark brown in color, or approved equal.

Material shall be uniform in size, free of foreign matter and suitable for topdressing of trees, shrubs or perennials.

Samples shall be submitted to Landscape Architect or Engineer for approval prior to purchase and delivery.

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Guying and Staking

Wood stakes shall be 2"x2" hardwood stakes, or approved equal, for vertical staking of trees. See tree staking detail for lengths and quantity of stakes.

Flat Woven webbing may be used instead of wire and hose for guying. Fasten trees to stakes using 3/4" wide, flat polypropylene material such as Arbortie™, or approved equal, that is knotted around or nailed to stakes. Any knot around the tree trunk or branches must be expandable.

Wire (for guying and staking) Tree staking wire shall be 12 gauge galvanized steel, or approved equal, double strand, twisted.

Hose shall be corded rubber, uniform in color and not less than 1/2" inside diameter.

Anti-Desiccant

Anti-desiccant shall be emulsion type, film forming agent designed to permit transpiration but retard excessive loss of moisture from plants.

Deliver in Manufacturer's fully identifiable containers and mix in accordance with Manufacturer's instructions.

07 02 08 EXECUTION

Tree and Shrub Planting & Transplanting

No tree planting operations shall take place until placing of topsoil has been completed.

Locations of plant material shown on plans are approximate. Final locations will vary from plan and shall be determined in the field under the direction of the Landscape Architect/Engineer.

Contractor shall provide pre-marked, color-coded flags for all shade trees, evergreen trees and flowering trees, with abbreviations that correspond with the Plant List. Landscape Architect or Engineer shall place the color-coded flags to indicate plant locations.

All transplanting shall be performed in strict accordance with the ANSI A300 Part 6 most current version, which are incorporated herein by reference.

For shrub mass planting, the entire bed subgrade shall be tilled 6" deep. Remove any stones over 1", sticks, roots, rubbish and any other extraneous matter. If the soil is heavy clay and silt, organic matter should be added based upon soil test recommendations.

Under no circumstances shall the Contractor pre-dig tree or shrub pits.

Upon final approval by the Landscape Architect or Engineer of tree placement, the Contractor shall paint a circle around the ball of the tree, move tree and excavate tree pit.

Excavation of Tree and Shrub Pits

Walls of tree pits shall be dug so that they are vertical or sloping outward in heavy soils, and scarified. Excavation shall be slightly raised in the center to provide proper drainage.

Tree pits must be a minimum of 2' greater in diameter than the ball of the tree or the spread of its roots.

Shrub pits and trenches must be a minimum of 1' greater in diameter than the ball of the shrub or the spread

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of its roots.

The depth of the tree and shrub pit shall be as deep as necessary to accommodate the ball of the tree so that it will not be necessary to raise or lower the plant material to bring it to the required grade. Tree pits shall be deep enough to allow 1/8 of the ball of the tree to be above finished grade. Plants shall rest on undisturbed existing soil or well-compacted backfill.

Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.

When pits have been dug, the Contractor shall partially fill with water a representative number of pits in each area to determine that there is adequate percolation in the subgrade at each pit. If not, notify the Landscape Architect or Engineer immediately.

Tree and Shrub Placement

Place tree or shrub in pit by carrying the ball and then lowering it into the pit. Never lift trees by their trunk or branches.

Set balled and burlapped (B&B) stock on bottom of pit, plumb and in the center of the pit, with the most desirable side facing the prominent view.

Prior to placing trees in the pit remove bottom of wire basket prior to placement in the pit. Upon placement in the pit, remove wire basket entirely, then cut and remove rope from the top 50% of rootball and pull burlap back to the edge of the rootball. Remove as much burlap, woven products and twine as possible. All plastic or synthetic film must be removed from rootball. Cut all twine away from canes.

For shrubs remove containers from all container grown shrubs, prior to placing material into the pit and slash the edges of the rootball from top to bottom, at least 1" deep, making 4-5 cuts. The slashing of roots may not be required for containers pre-treated with copper coating.

Set shrub straight and in the center of the pit with the most desirable side facing the prominent view.

Backfilling Tree and Shrub Pits

Tree and Shrub pits shall be backfilled with topsoil mixture as specified in 7.3.8.

Trees and shrubs must remain straight throughout backfilling.

Place backfill around base and sides of rootball, working each layer to settle backfill and eliminate air pockets and voids. When backfill is 2/3 completed, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Place final layer of backfill, tamp firmly and water again until no more water is absorbed.

Never cover top of rootball with soil.

Form a soil saucer above finished grade around the outer rim of tree and shrub pit.

Mulch top of rootball and saucer to a depth of 3" with shredded hardwood bark mulch. Do not place mulch against trunk.

Pruning of Trees and Shrubs

Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice.

Pruning shall be restricted to corrective pruning to improve form only. This includes structure, dead, damaged, diseased and/or conflicting branches.

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Do not cut main leader unless directed by Landscape Architect or Engineer to do so. Remove only injured or dead branches from flowering trees, if any.

If side branches are cut to balance tree, make all cuts back to a lateral branch or bud.

Prune out any dead or broken branches.

Final pruning shall be done after trees and shrubs are in place.

Remove and replace excessively pruned stock resulting from improper pruning.

Remove all tags, labels, strings and wire from tree unless otherwise directed by Landscape Architect or Engineer.

After final pruning, apply anti-desiccant where appropriate using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.

Tree Staking (Trees Under 6" Cal.)

Staking shall be completed as soon as possible after planting of tree. Number of stakes shall be as shown on the tree staking detail on the drawings.

Space tree stakes evenly and vertically on the outside of the rootball and drive firmly into the ground. Stakes shall be driven at an angle and drawn inward to **vertical**.

Cut pieces of hose long enough to loop around trunk.

Place hose around trunk at the height required to provide optimum support. Thread the wire through the hose and pull both ends horizontally 2' beyond stake.

Twist the wires together starting at the rubber hose. Wind both ends of the wires around the stake twice then twist wire back on itself to hold securely. Cut off excess wire. Wire shall be 3" min. from the top of the stake.

Tree Guying (Evergreen Trees)

Guying shall be completed as soon as possible after planting of tree. Number of stakes shall be as shown on the tree staking detail on the drawings.

Cut pieces of hose long enough to loop around trunk.

Space steel angles evenly around, and 18" from the outside of tree pit and drive firmly into the ground allowing the end of the angle to project 6" above grade.

Place hose around trunk just above lowest stout branch at 2/5 to 3/5 the height of the tree.

Twist the wires together starting at the rubber hose. Wind both ends of the wire through the hole in the steel angle and twist wire back on itself to hold securely. Cut off excess wire.

Planting and Transplanting of Herbaceous plant materials

Preparation of Planting Beds

The entire bed subgrade shall be tilled 8" deep. Remove any stones over 1", sticks, roots, rubbish and any other extraneous matter.

Dig beds not less than 8" deep and mix with soil amendments and fertilizer as recommended by soil test

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analysis.

Spread planting soil mixture to a minimum depth required to meet lines, grades and elevations shown, after light rolling and settlement as follows:

Place approximately 1/2 the total amount of planting soil required and work into the top of the loosened subgrade to create a transition layer.

Place remainder of planting soil.

Mulch entire planting bed with 2" shredded hardwood bark mulch.

Placing Plants

Before planting, biodegradable pots shall be split and non-biodegradable pots shall be removed. Root systems of all potted plants shall be split or crumbled.

Plants shall be installed so that the roots are surrounded by soil below the mulch.

Potted plants shall be set so that the top of the pot is even with finished grade.

Roots of bare root plants shall be covered to the crown.

The entire bed shall be thoroughly watered.

Treat the mulched and planted bed with a pre-emergent herbicide only as directed by the Landscape Architect or Engineer. Apply only when foliage is dry to prevent foliar burn.

Watering

All material shall be thoroughly watered at one (1) week intervals throughout the summer as follows:

A hose without a nozzle should be inserted into the soil just beyond the rootball and water allowed to run at a moderate rate until it bubbles to the surface. Remove hose and place at a new location, diametrically opposite, and allow the water to run until the earth saucer is filled to the brim. If this water is absorbed before 15 minutes have elapsed, the procedure should be repeated immediately, and again for as many times as necessary, until the saucer retains water for more than 15 minutes.

During the month commencing with the third week in August and ending with the third week in September, the interval between waterings shall be extended to 2 weeks in order to allow the buds to harden. After the third week in September, watering shall be resumed on a weekly basis until frost.

Maintenance of all plant materials

Maintenance shall begin immediately after planting.

Contractor shall maintain trees until final acceptance by Landscape Architect or Engineer, but in no case less than 60 days after completion.

Maintain trees and shrubs by pruning, cultivation and weeding as required for healthy growth in conformance with standard horticultural practice.

Contractor shall restore planting saucers, tighten and repair stake and guy supports and reset trees as required.

Spray trees and shrubs as necessary to keep material free of insects and disease.

SECTION 02000 – SITE WORK

Contractor shall maintain herbaceous materials as follows:

If a timed-release fertilizer has been incorporated during plant installation, no more fertilizer need be applied during the first growing season.

After the first growing season fertilize perennials with a slow release fertilizer or any 50% organic fertilizer, or mulch perennials with compost 1" deep.

Cut all deciduous perennials flush to the ground March 1, if not done the previous fall, to allow new growth to develop freely.

Ornamental grasses shall be cut back only in the spring unless otherwise directed by Landscape Architect.

Mulch perennial bed once, in early spring, at 1/2" to 1" depth. If soil is bared in late fall, remulch lightly after ground is frozen to protect perennials.

Inspect and treat for insect and disease problems.

DIVISION 09, STRUCTURAL

SECTION 09 01 – STRUCTURAL EARTHWORK

09 01 01 GENERAL

The following section applies to structural earthwork, earthwork conducted for foundations of steps and ramps, paved areas and other structures where soil bearing of structural loads will occur.

09 01 02 STRIPPING OF TOPSOIL

On all areas where grading is to be performed, including the areas within the lines of building construction, the topsoil shall be carefully removed and spread either on areas already graded and prepared for topsoil or in stockpiles conveniently located on the areas which are subsequently to receive application of topsoil.

Any clearing required on the site shall conform to Division 2, Section 1 of these specifications. Clearing shall be performed only to the limits shown on the plans. The Contractor is responsible for the removal of all debris resulting from the removal of trees including, but not limited to, stumps, trunks, roots, branches, leaves, etc.

09 01 03 FOUNDATION EXCAVATION

After stripping topsoil, the then existing surfaces shall be excavated or filled to elevations and slopes indicated on the drawings. Existing soils under all structures shall be excavated as shown on the plans on the site and disposed in accordance with borrow fill section 02 03

09 01 04 SUBSTRUCTURE FILL & COMPACTION

The contractor shall supply all the necessary Select Borrow Excavation/Structural Fill required to achieve the proposed finished grades for the building. Select compacted borrow material shall be used to attain the proposed footing or subgrade levels where insufficient existing material exists in the areas of proposed structures.

Select Borrow Excavation/Structural Fill shall be certified clean, well graded granular material and shall be in general conformance with NJDOT gradation designation I-10, Borrow Excavation Bridge Foundation and conform with the provided geotechnical report.

Select borrow shall be placed in maximum eight (8) inch thick lifts and compacted to not less than 95% of maximum standard dry density (unless otherwise noted), ASTM D698-78 below and above footing founding levels.

Unless noted otherwise on the plan, or in the geotechnical report (if supplied) at least six (6) inch thick crushed stone or course gravel base course shall be provided beneath floor slabs.

09 01 05 BACKFILL AND COMPACTION

Backfill at structural walls shall be a clean well graded granular material and shall have no more than 25% by weight passing the 200 sieve. Backfill shall be placed in maximum 8" thick lifts and compacted to not less than 95% of maximum standard dry density (unless otherwise noted), ASTM D698-78 using light walk-behind compactors to avoid putting excessive pressure on retaining walls and foundation.

09 01 06 EMBANKMENT AND COMPACTION

In areas requiring fill other than Substructure Fill and Backfill as defined above, embankment shall be suitable, on site, clean sand fill, or suitable borrow material, approved by the Engineer. Material shall be compacted in maximum eight (8) inch thick layers to 95% maximum density at a moisture content within 2% of optimum (unless otherwise noted).

09 01 07 DEWATERING

The Contractor shall pump out or otherwise remove any water which may be found in the excavation, and he shall provide

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all pipe underdrains, dams, flumes, or other works necessary to keep the excavation entirely clear of water while the foundations are being laid and the masonry constructed. Newly laid masonry shall be protected from injury by fluming, pumping, bailing, well pointing, or by other approved methods. The Contractor shall at all times have upon the work site sufficient dewatering equipment ready for immediate use. (Contractor to refer to geotechnical report for additional information.)

09 01 08 SHEATHING AND BRACING

The Contractor shall keep the excavation properly and adequately sheathed and braced at all times during the progress of the work, in order to prevent accidents, caving of the sides of the excavation and damage to the structures. Such sheathing and bracing shall be included in the contract price for the item to which the work pertains, and the Contractor will be held responsible for any damage due to failure or insufficiency of the sheathing or bracing.

09 01 09 UNDERGROUND UTILITIES AND APPURTENANCES

Earthwork for underground utilities and appurtenances shall be in accordance with Division 2 of the Specifications.

SECTION 09 02 – STRUCTURAL CONCRETE

09 02 00 GENERAL

Work on the reinforced concrete footings and foundations for the Steps and ramps shall conform to all requirements of ACI 301-16 “Specifications for Structural Concrete” published by the American Concrete Institute, Farmington Hills, Michigan except as modified by these Contract Documents”

For other concrete work see Division 4.

09 02 01 FORMWORK AND FORMWORK ACCESSORIES

Use commercially manufactured sleeves, inserts, anchors and other embedded items suitable where required. Show aforementioned items in shop drawings and submit manufacturer’s product data.

09 02 03 REINFORCEMENT AND REINFORCEMENT SUPPORTS

Use deformed billet steel bars complying with ASTM A615 Grade 60, unless otherwise shown.

Use black annealed steel 16 gage tire wire conforming to ASTM A853.

Devices for spacing, supporting and fastening reinforcement in place shall conform to the following:

Use CRSI recommended Class 3 rebar supports for carbon steel reinforcement,

Do not use brick, wood or other non-complying materials

For slabs on grade, use sand plates or horizontal runners where base material will not support chair legs

09 02 04 CONCRETE MIXTURES

All structural concrete used in footings and foundations shall conform to the following Exposure Classes S1, F2, W1, C1.

All structural concrete used in footing and foundations shall develop a minimum $f'c = 4500$ psi with a total air content of 6.0% for a maximum aggregate size either $\frac{3}{4}$ inch or 1 inch.

SECTION 02000 – SITE WORK

09 02 05 HANDLING, PLACING & CONSTRUCTING

All footings shall bear on undisturbed natural soil or properly compacted controlled fill installed atop the native soils. The footings shall bear on soil capable of supporting the bearing pressure of shown on the Plan. Contractor shall verify this capability in the field. Footing depths shown on the Plans are to be considered minimum; footing depths shall be deeper if required to provide the support indicated above.

Where pipes, conduits, sleeves, etc. pass beneath footings, said items, etc. shall be encased solid on all sides with a minimum of 6" thick concrete. When construction of footings precedes placement of said items, etc. the item installer shall be responsible for encasing said item, etc. as noted herein, No item, etc. shall be located beneath piers, beam bearing pilasters, column footings, etc, except as specifically detailed on the Plans.

If encountered, remove areas of unsuitable materials including topsoil, roots, vegetation, fill or backfill, unsuitable soils to a distance five (5) feet beyond the limits of construction for the building area. Remove any existing improvements and related backfill or adequately protect those planned to remain.

Unsuitable materials and unstable areas shall be removed and replaced with controlled fill or crushed stone. consisting of clean 3/4" inch crushed stone or washed gravel.

Supply and install all fill necessary to reach the design subgrade level. Fill shall be controlled compacted material that is spread layers eight (8") inch or less in loose thickness and uniformly compacted to at least 95 percent of maximum dry density as determined by the ASTM D1557 test procedure.

Maintain relatively dry excavations at all times during construction.

No fill materials shall be placed, spread or rolled while ground or fill is frozen or thawing, or during periods of precipitation. Following precipitation interruptions of fill work, fill operations shall not be resumed until the moisture content and density of all materials are checked by the Engineer. Corrective action will be required where the Engineer's inspection (or tests required of the Contractor by the Engineer) show support values are less than those specified. All required corrections shall be the responsibility of the Contractor.

No concrete that has partially hardened shall be deposited, nor shall retempered concrete be used.

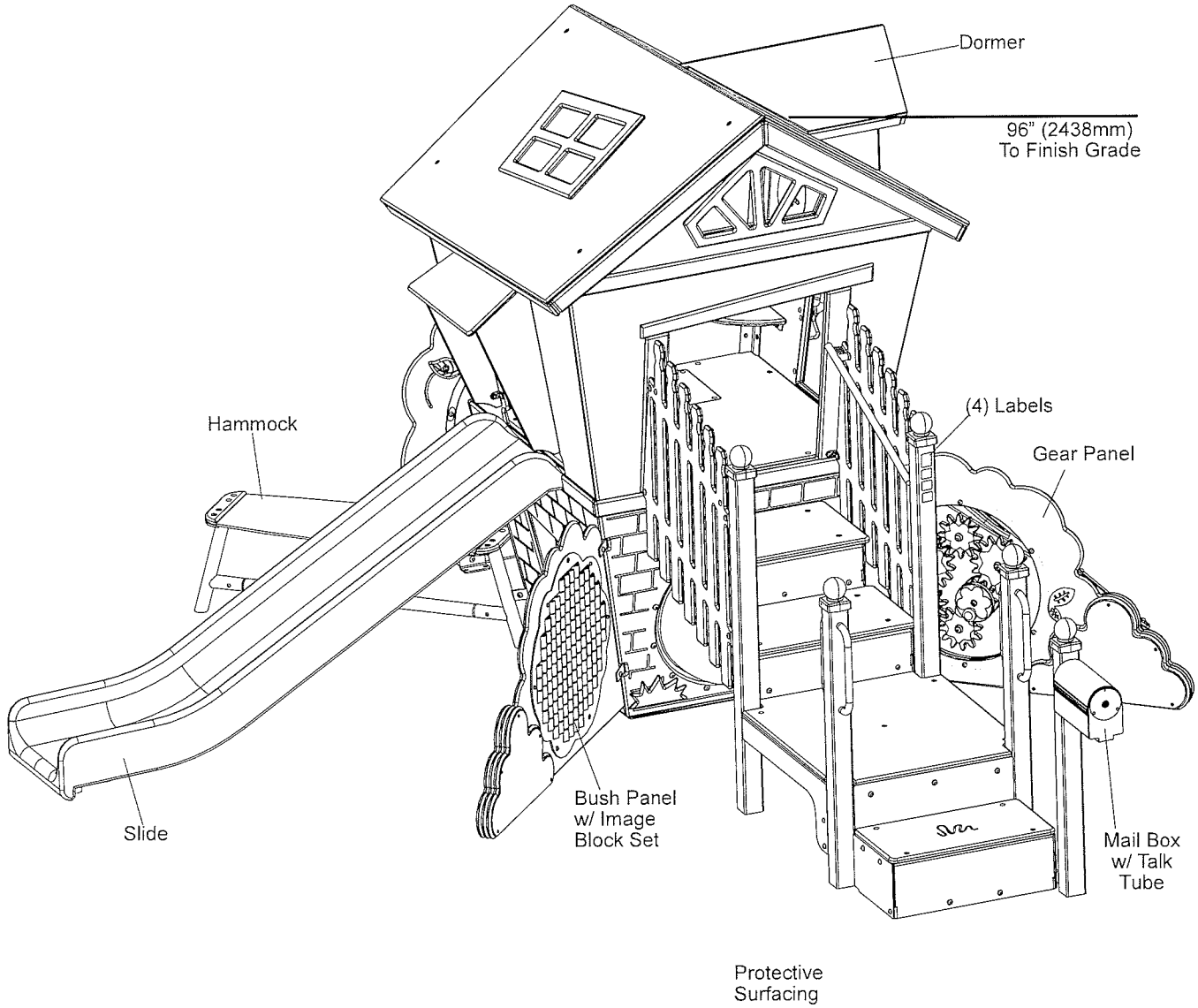
All exposed concrete surfaces shall be smooth-rubbed finish. All formed concrete not exposed shall have an as-cast surface finish – 1.0 except as otherwise noted.

Construct all concrete aprons, door pads, sidewalks and other walking surfaces shown on the Plans or otherwise specified in these Specifications. Unless otherwise noted, such items shall not be less than 4 inches thick and shall be broomed finished.

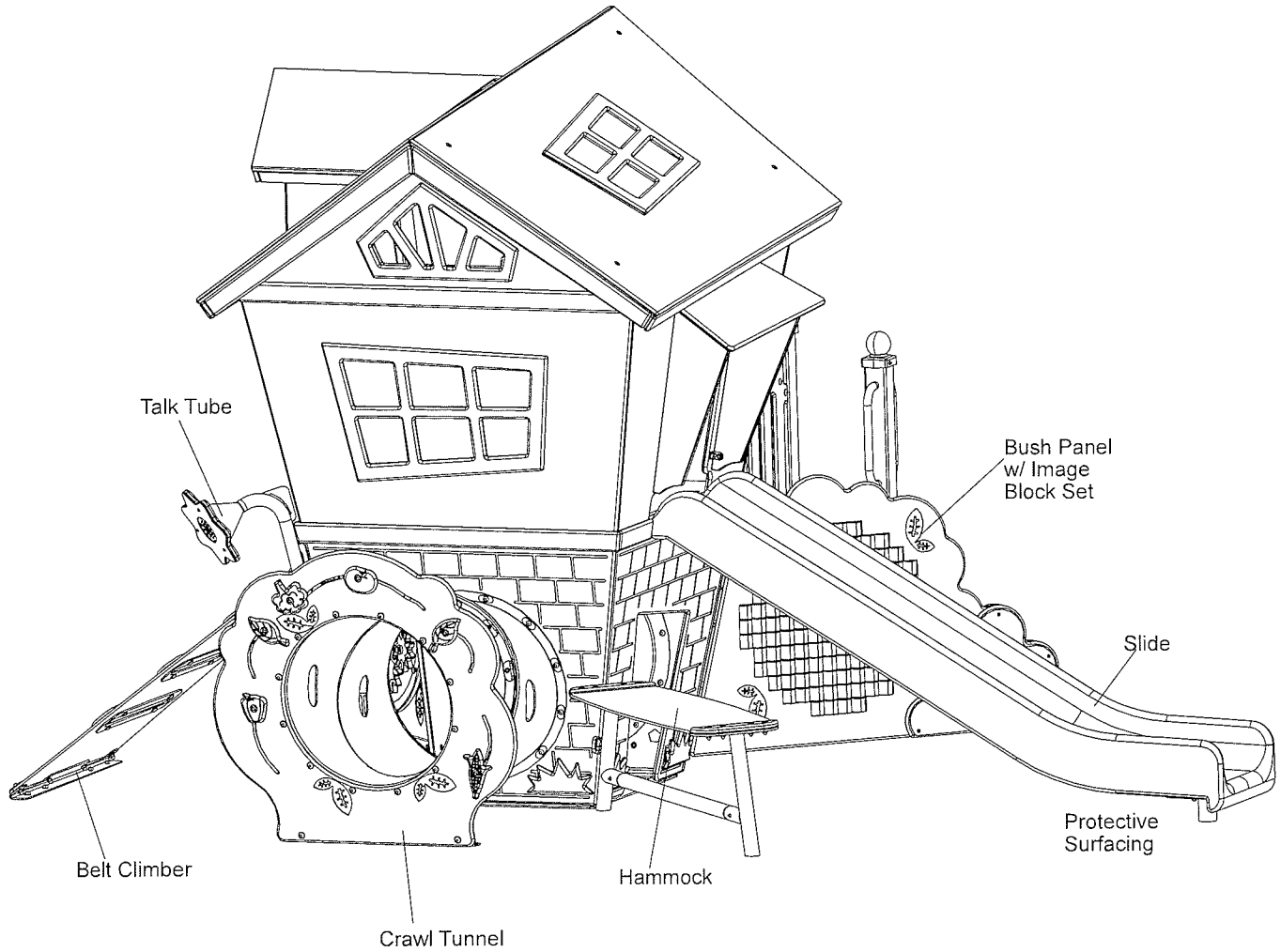
SECTION 02001 - PLAYGROUND CUT SHEETS

The Playground Cut Sheets contained herein are the Basis of Design for the Playground equipment to be included in the Bid. Approved equal manufacturers will be considered in accordance with Specification Section 01300 - Submittals.

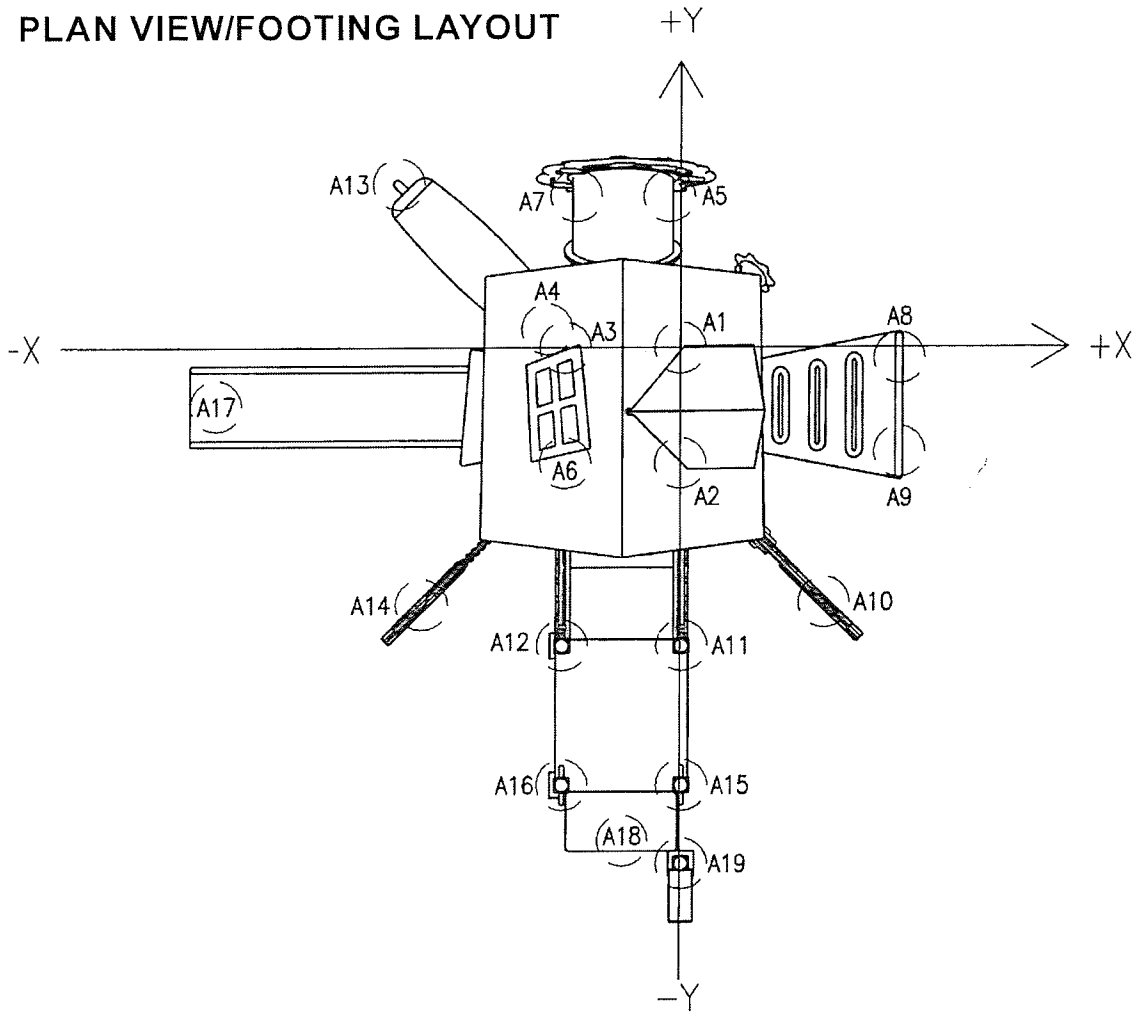
FRONT VIEW



BACK VIEW



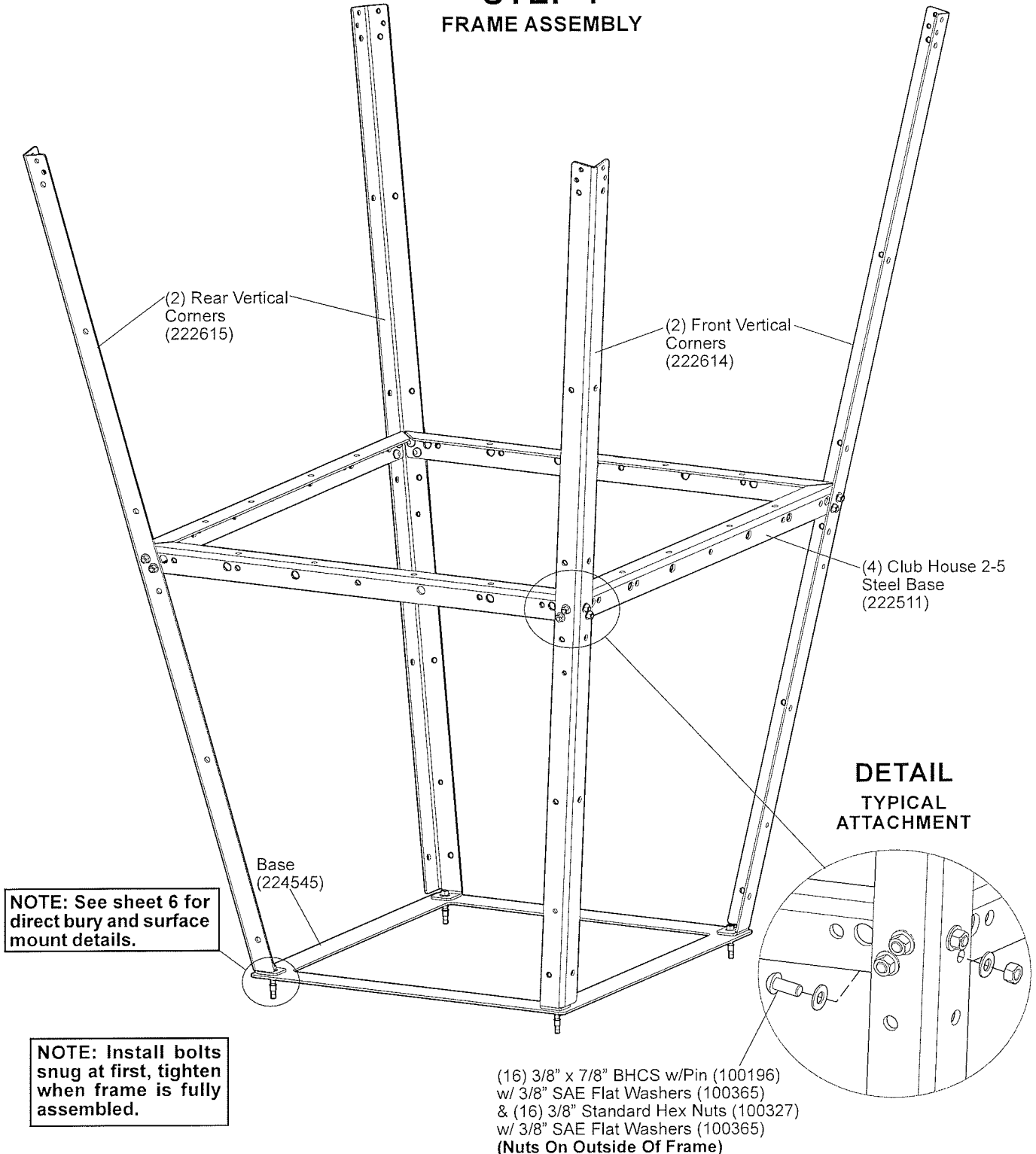
PLAN VIEW/FOOTING LAYOUT

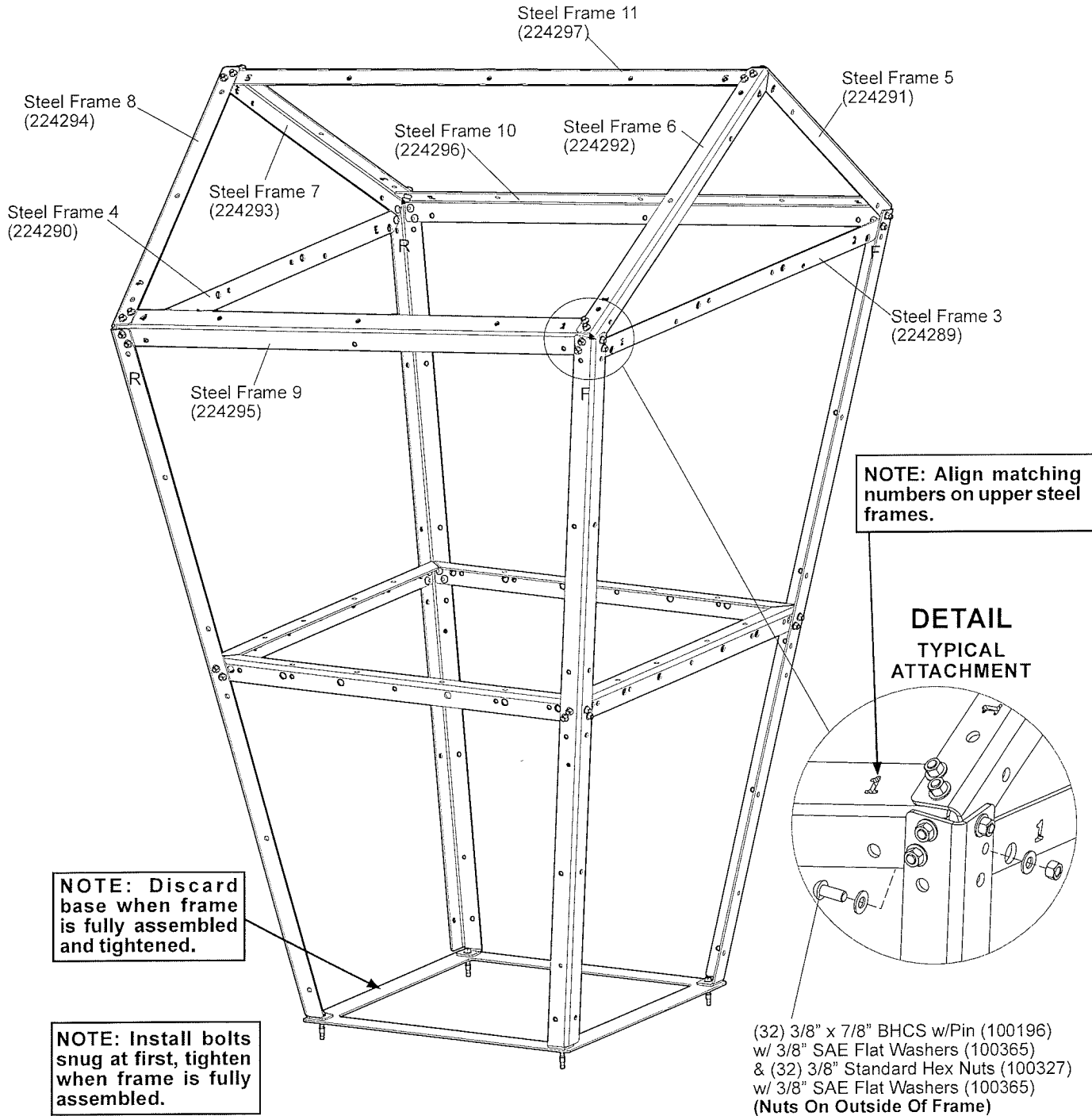


N.	I.D.	X (ft-in)	Y (ft-in)	Dist. to 0	DIA (in)
1	A1	0"	0"	0"	12
2	A2	0"	-2'-3"	2'-3"	12
3	A3	-2'-3"	0"	2'-3"	12
4	A4	-2'-7"	4"	2'-8"	12
5	A5	-3"	3'	3'	12
6	A6	-2'-3"	-2'-3"	3'-2"	12
7	A7	-2'-1"	3'	3'-7"	12
8	A8	4'-4"	-3"	4'-4"	12
9	A9	4'-4"	-2'-1"	4'-9"	12
10	A10	2'-10"	-5'	5'-9"	12
11	A11	0"	-5'-10"	5'-10"	12
12	A12	-2'-4"	-5'-10"	6'-3"	12
13	A13	-5'-6"	3'-2"	6'-4"	12
14	A14	-5'-1"	-5'-1"	7'-2"	12
15	A15	0"	-8'-7"	8'-7"	12
16	A16	-2'-4"	-8'-7"	8'-11"	12
17	A17	-9'-1"	-1'-2"	9'-2"	12
18	A18	-1'-2"	-9'-8"	9'-9"	12
19	A19	0"	-10'-2"	10'-2"	12

N.	I.D.	X (m)	Y (m)	Dist. to 0	DIA (cm)
1	A1	0.00	0.00	0.00	30
2	A2	0.00	-0.69	0.69	30
3	A3	-0.69	0.00	0.69	30
4	A4	-0.80	0.11	0.80	30
5	A5	-0.07	0.90	0.91	30
6	A6	-0.69	-0.69	0.97	30
7	A7	-0.63	0.90	1.10	30
8	A8	1.31	-0.06	1.31	30
9	A9	1.31	-0.62	1.45	30
10	A10	0.86	-1.52	1.75	30
11	A11	0.01	-1.78	1.78	30
12	A12	-0.70	-1.78	1.92	30
13	A13	-1.68	0.98	1.94	30
14	A14	-1.54	-1.54	2.17	30
15	A15	0.01	-2.62	2.62	30
16	A16	-0.70	-2.62	2.71	30
17	A17	-2.77	-0.35	2.79	30
18	A18	-0.34	-2.95	2.97	30
19	A19	0.01	-3.09	3.09	30

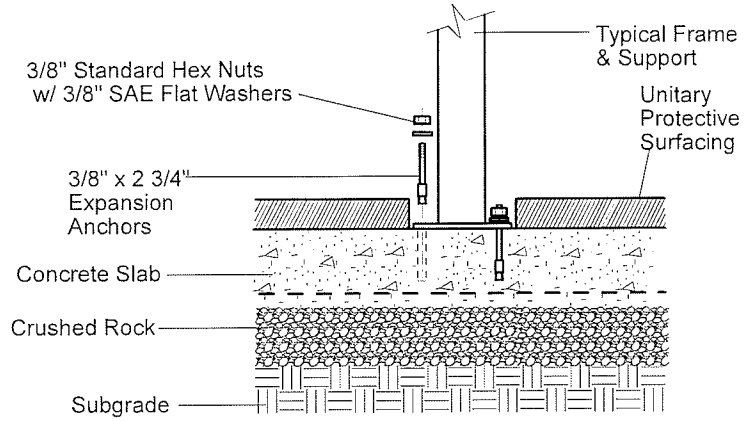
**STEP 1
FRAME ASSEMBLY**



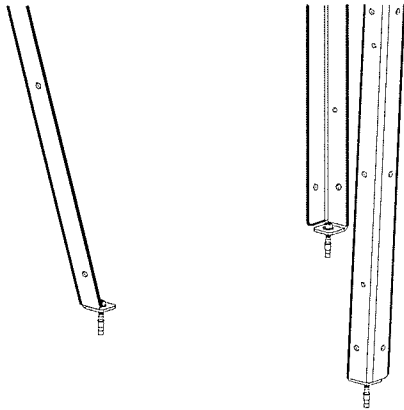


- 1) **(Surface Mount)** After frame has been assembled and placed in final location, drill 3/8" x 3" deep holes through frame tabs into concrete slab using 3/8" masonry bit and hammer drill. Tap 3/8" x 2 3/4" expansion anchors into drilled holes and fasten with 3/8" standard hex nuts and 3/8" SAE flat washers.
- 2) **(Direct Bury)** After frame has been assembled, remove base and attach direct bury legs.

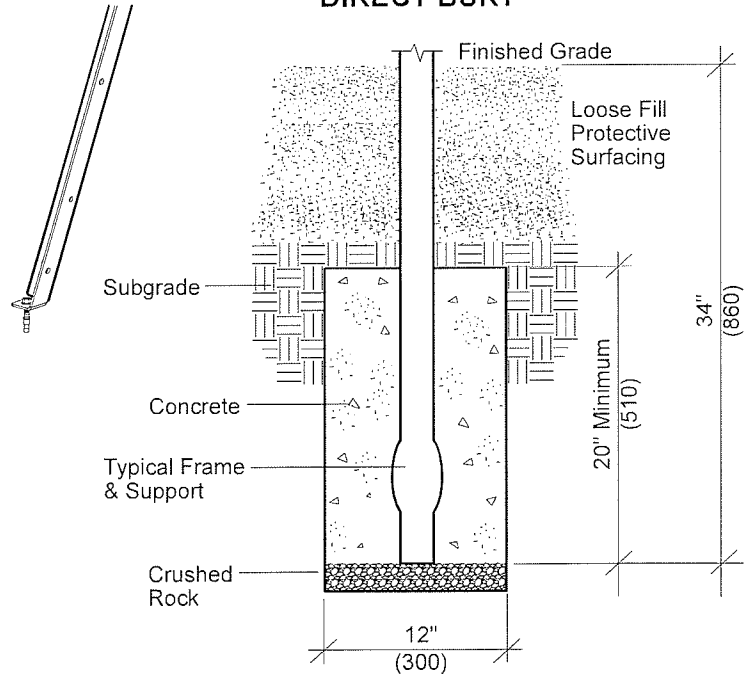
**DETAIL
 SURFACE MOUNT**



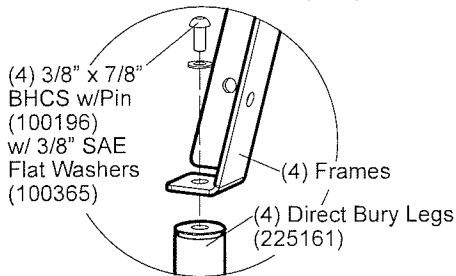
**DETAIL
 FRAME W/ANCHORS (SM)**



**DETAIL
 DIRECT BURY**

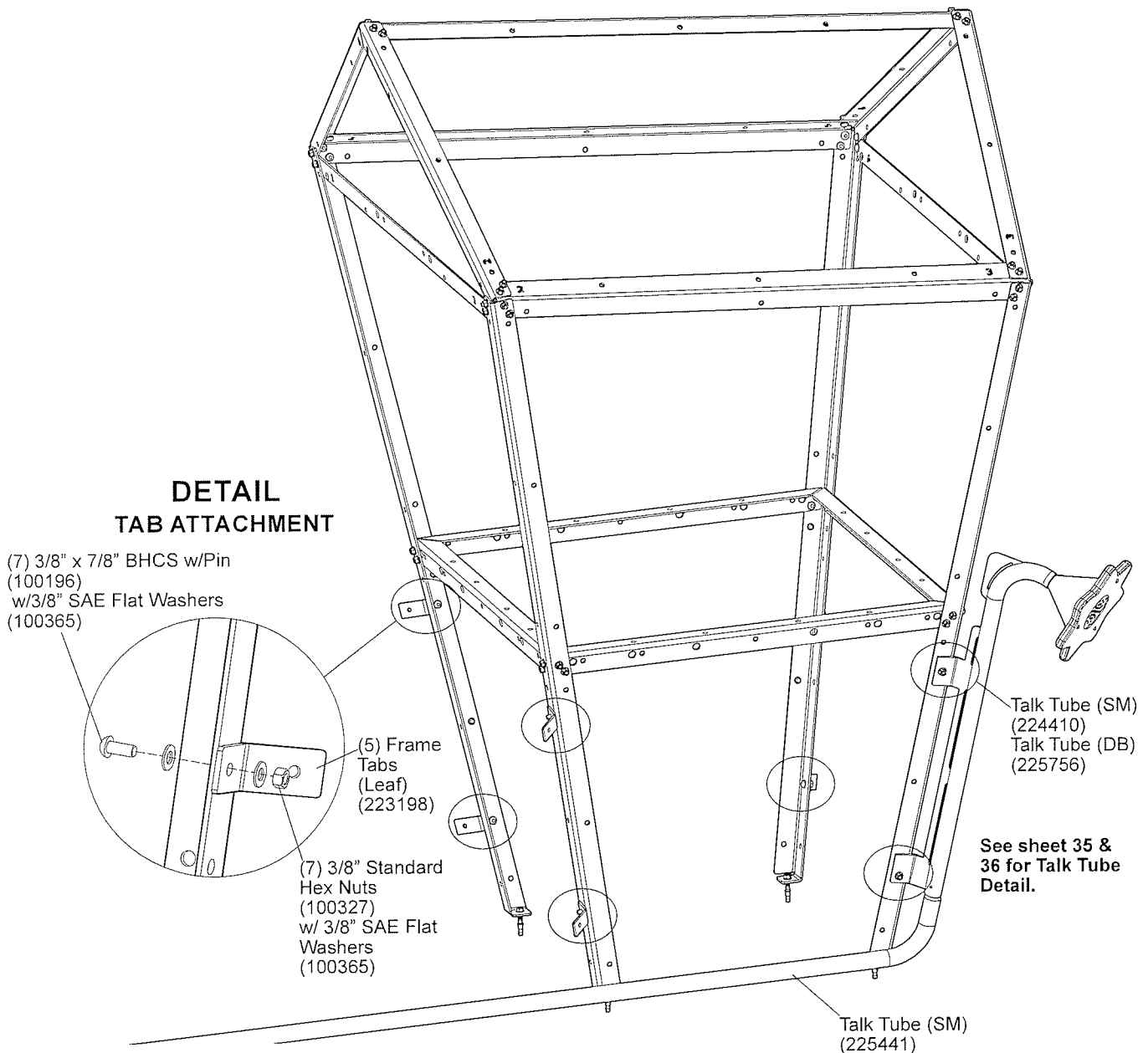


**DETAIL
 LEG ATTACHMENT (DB)**



STEP 2

- 1) Assemble talk tube as shown on sheets 35, 36 & 37. Attach tabs and talk tube assembly to frame.



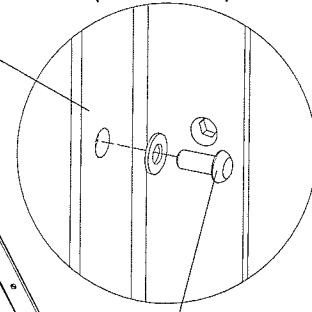
STEP 3

1) Attach lower panels.

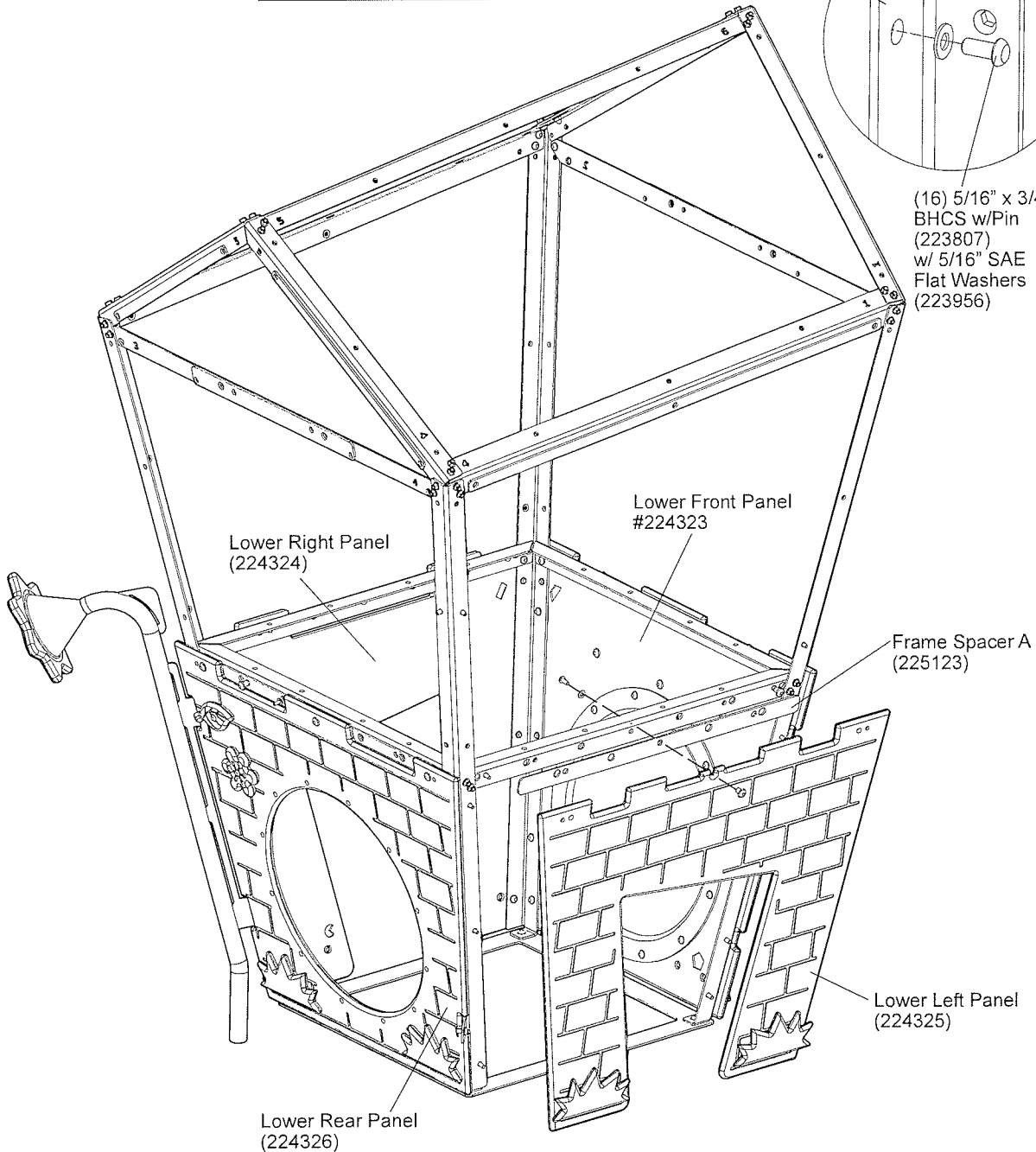
IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

DETAIL PANEL TO FRAME ATTACHMENT (TYPICAL)

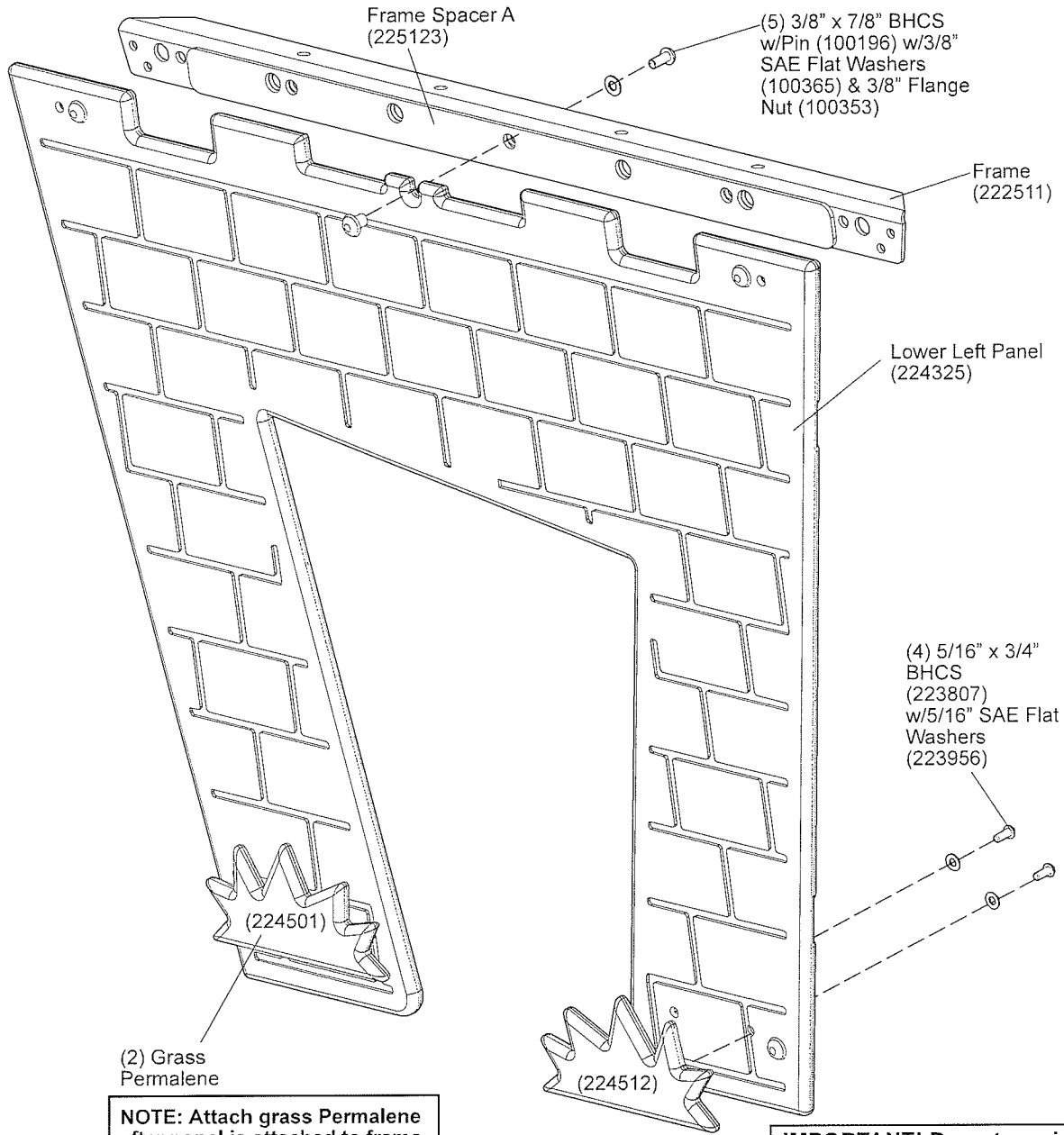
Frame



(16) 5/16" x 3/4" BHCS w/Pin (223807) w/ 5/16" SAE Flat Washers (223956)



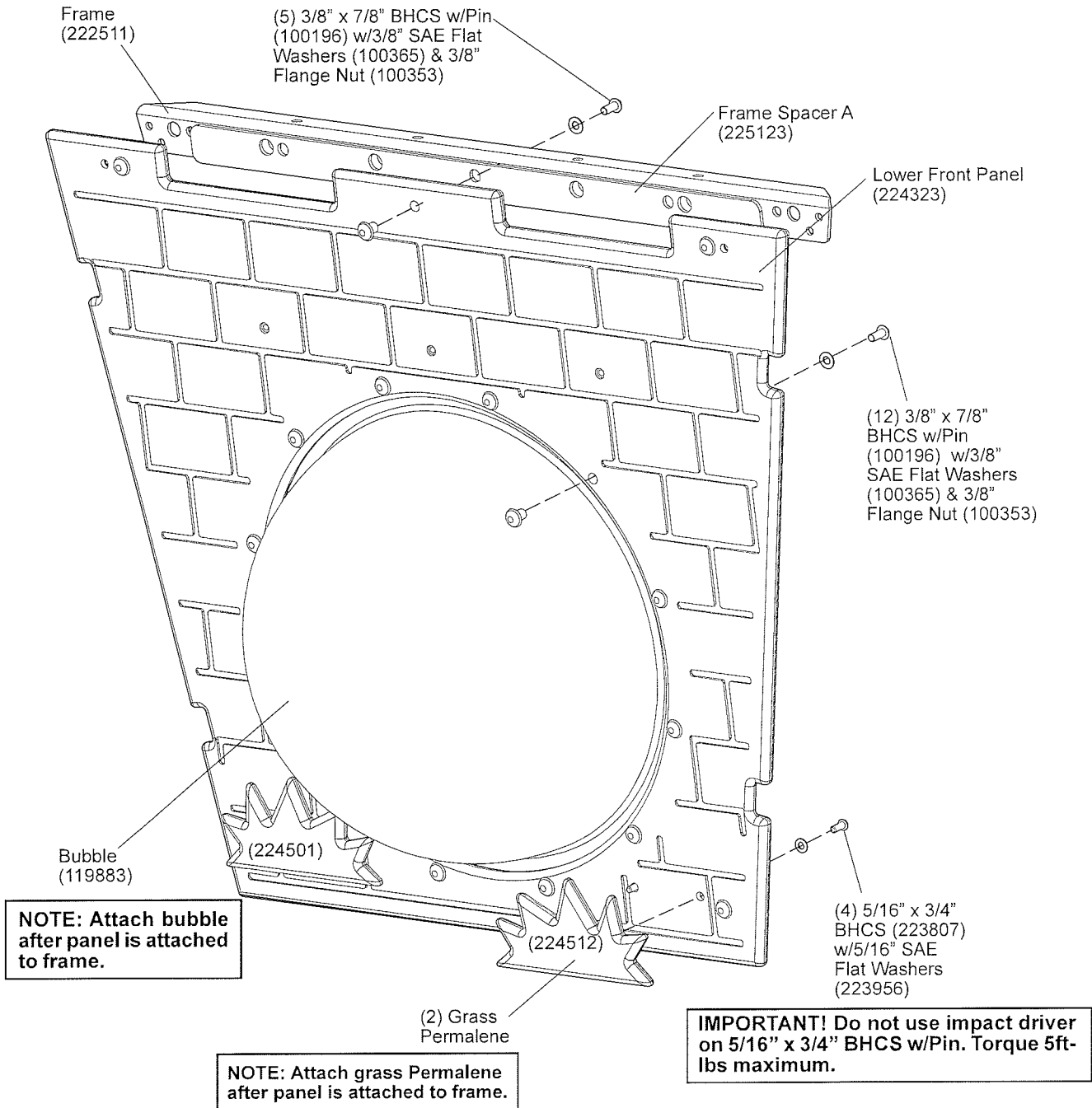
DETAIL
LOWER LEFT PANEL ATTACHMENT



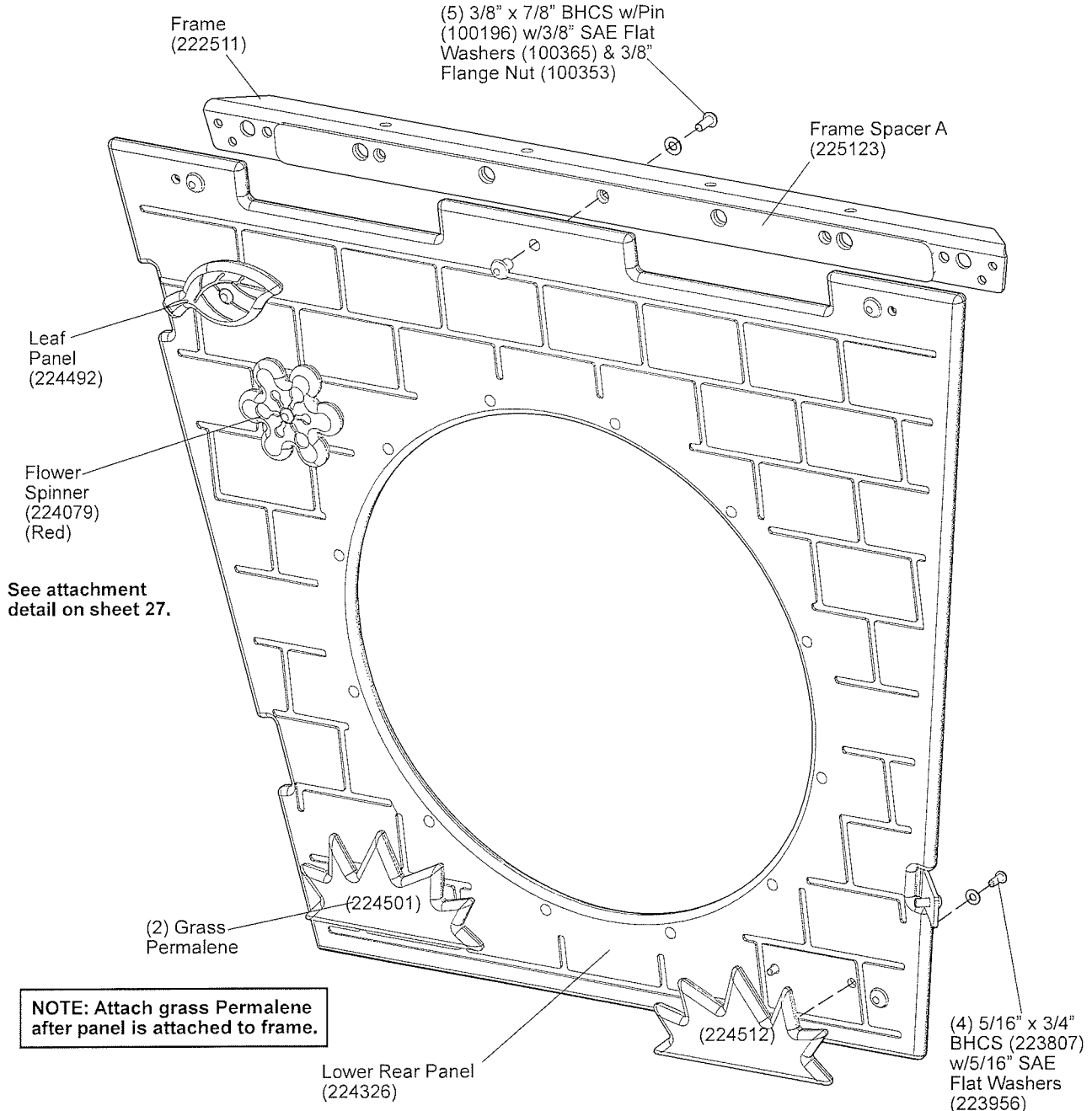
NOTE: Attach grass Permalene after panel is attached to frame.

IMPORTANT! Do not use impact driver on 5/16\"/>

DETAIL
LOWER FRONT PANEL ATTACHMENT



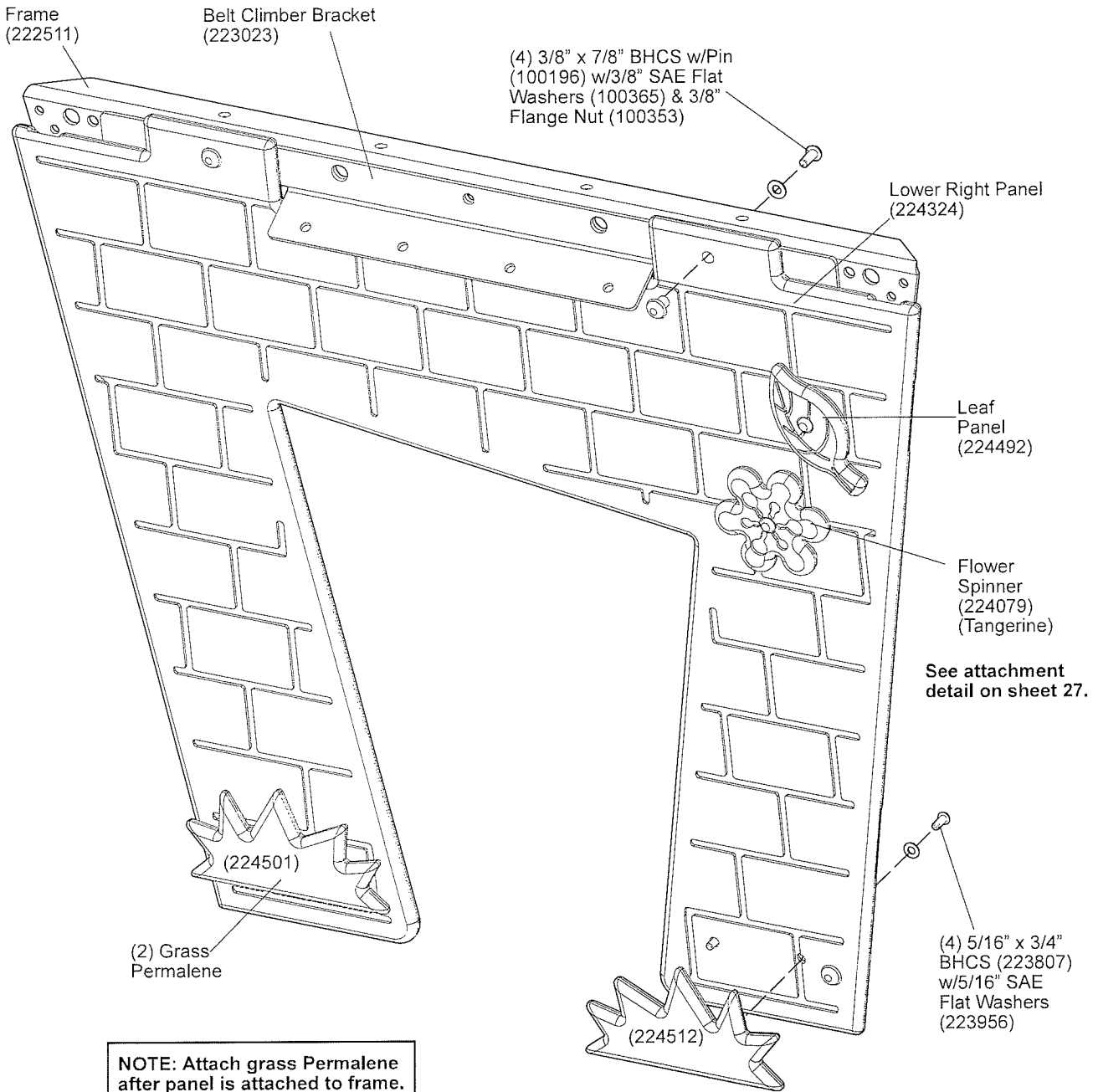
DETAIL
LOWER REAR PANEL ATTACHMENT



NOTE: Attach grass Permalene after panel is attached to frame.

IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

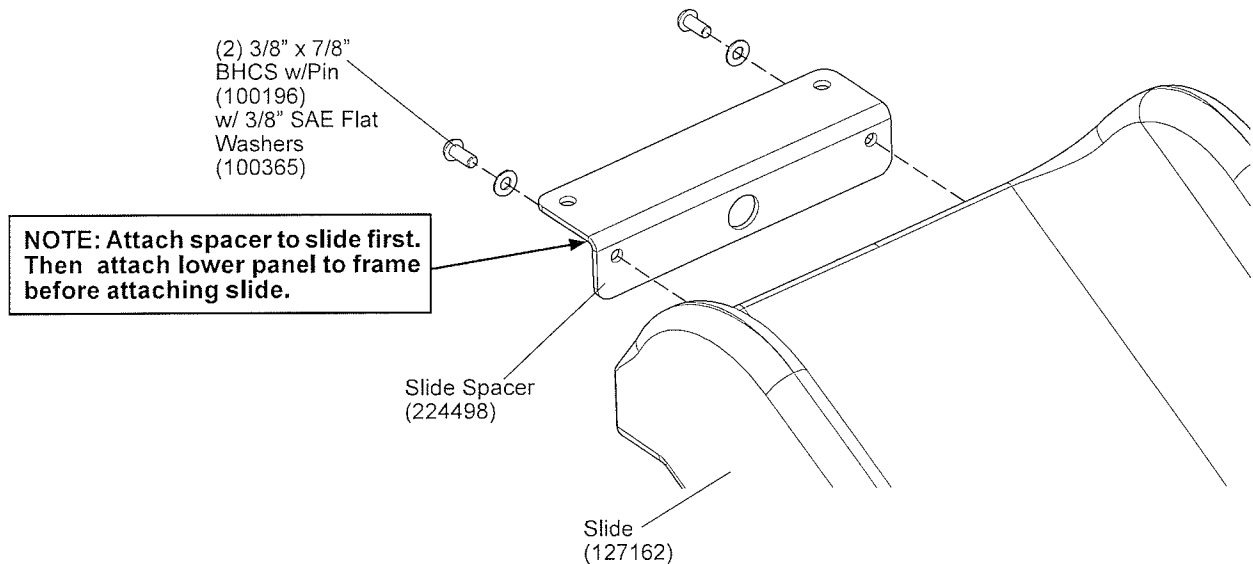
**DETAIL
LOWER RIGHT PANEL ATTACHMENT**



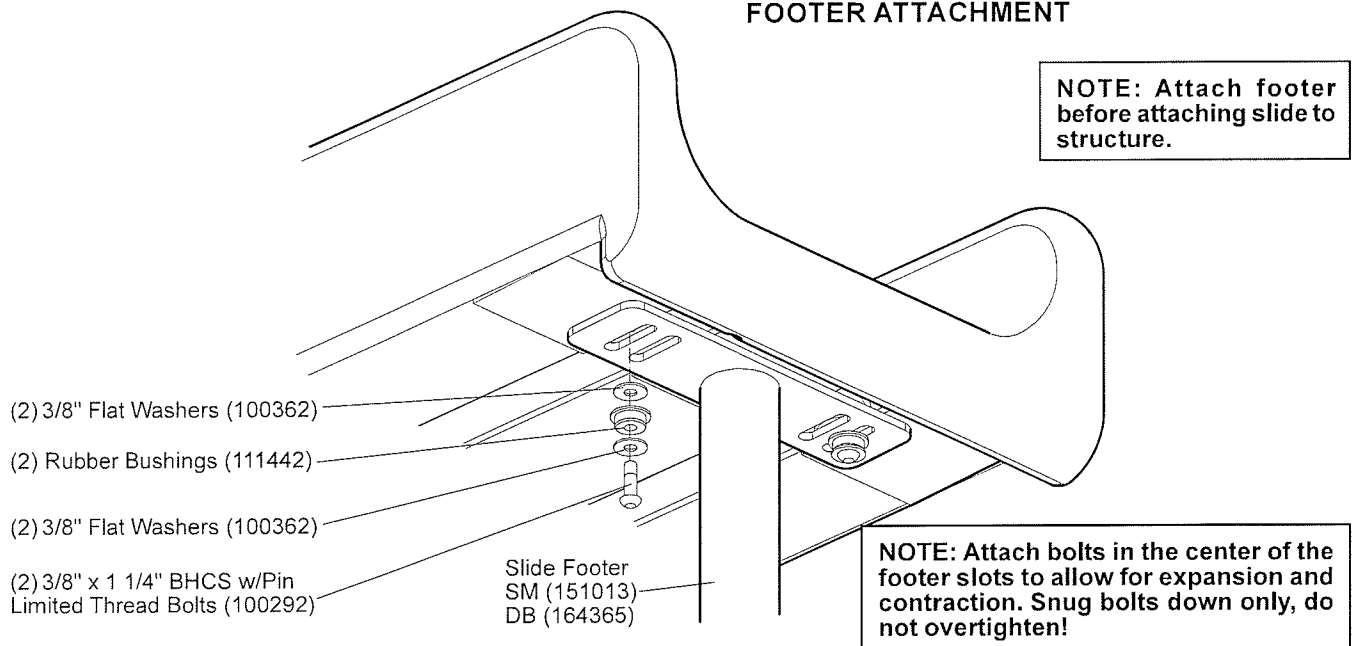
NOTE: Attach grass Permalene after panel is attached to frame.

IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

**DETAIL
SLIDE ATTACHMENT**

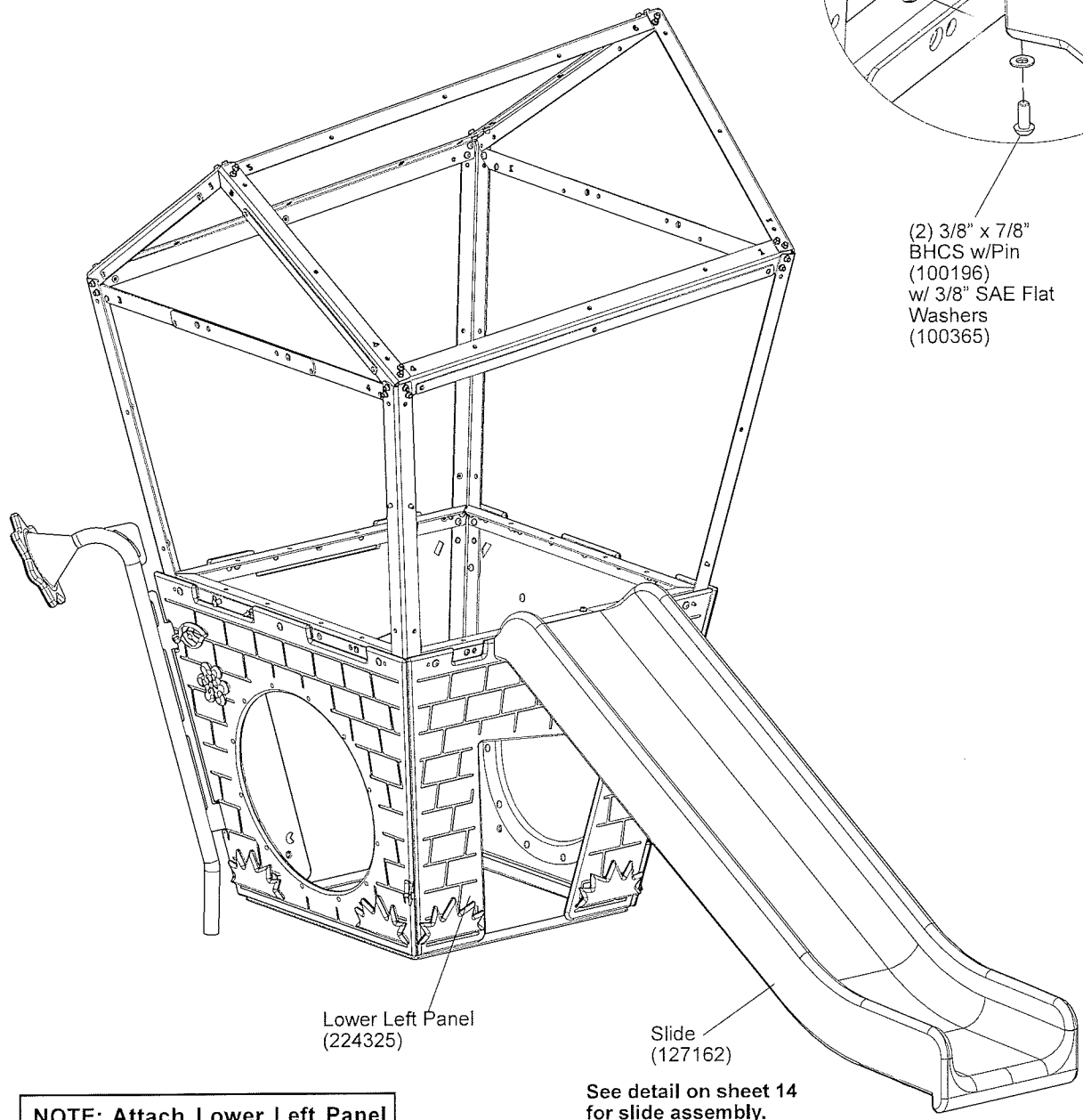


**DETAIL
FOOTER ATTACHMENT**



STEP 4

- 1) Attach slide spacer and footer to slide. Attach slide spacer to steel base using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers & 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to sheet 13.



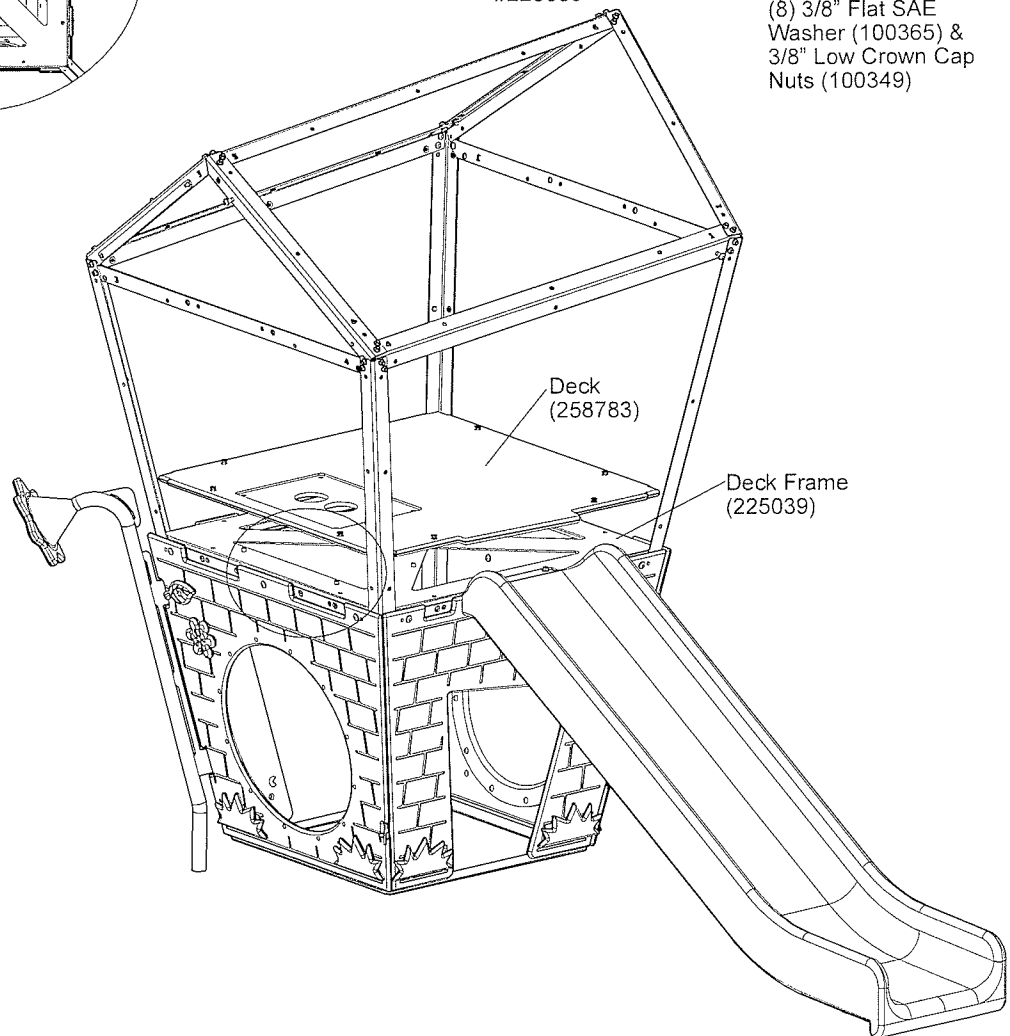
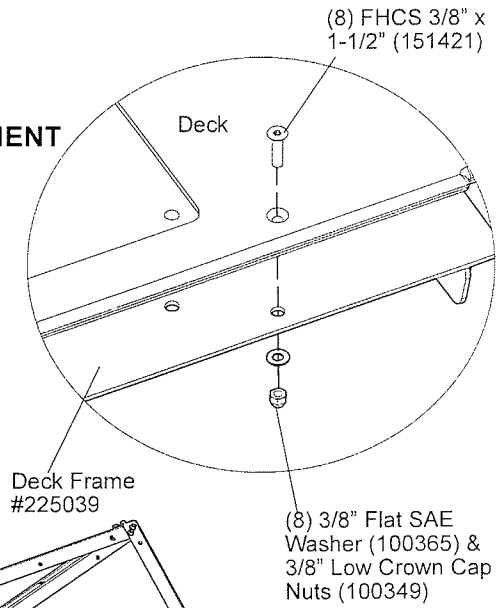
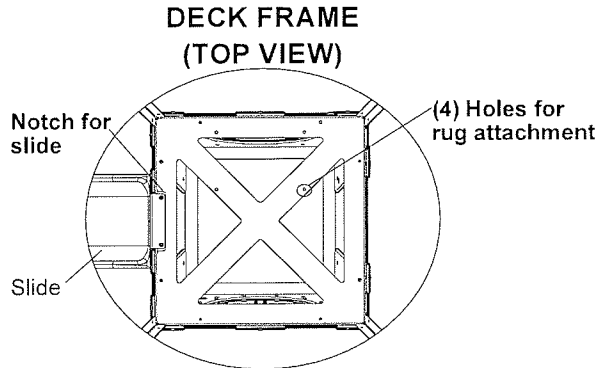
NOTE: Attach Lower Left Panel first, then attach slide.

See detail on sheet 14 for slide assembly.

STEP 5

1) Attach deck.

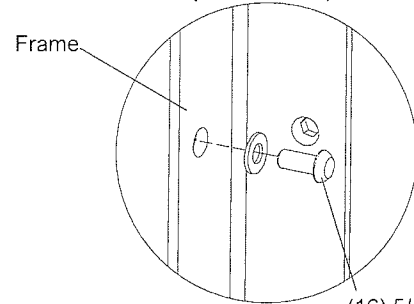
DETAIL DECK ATTACHMENT



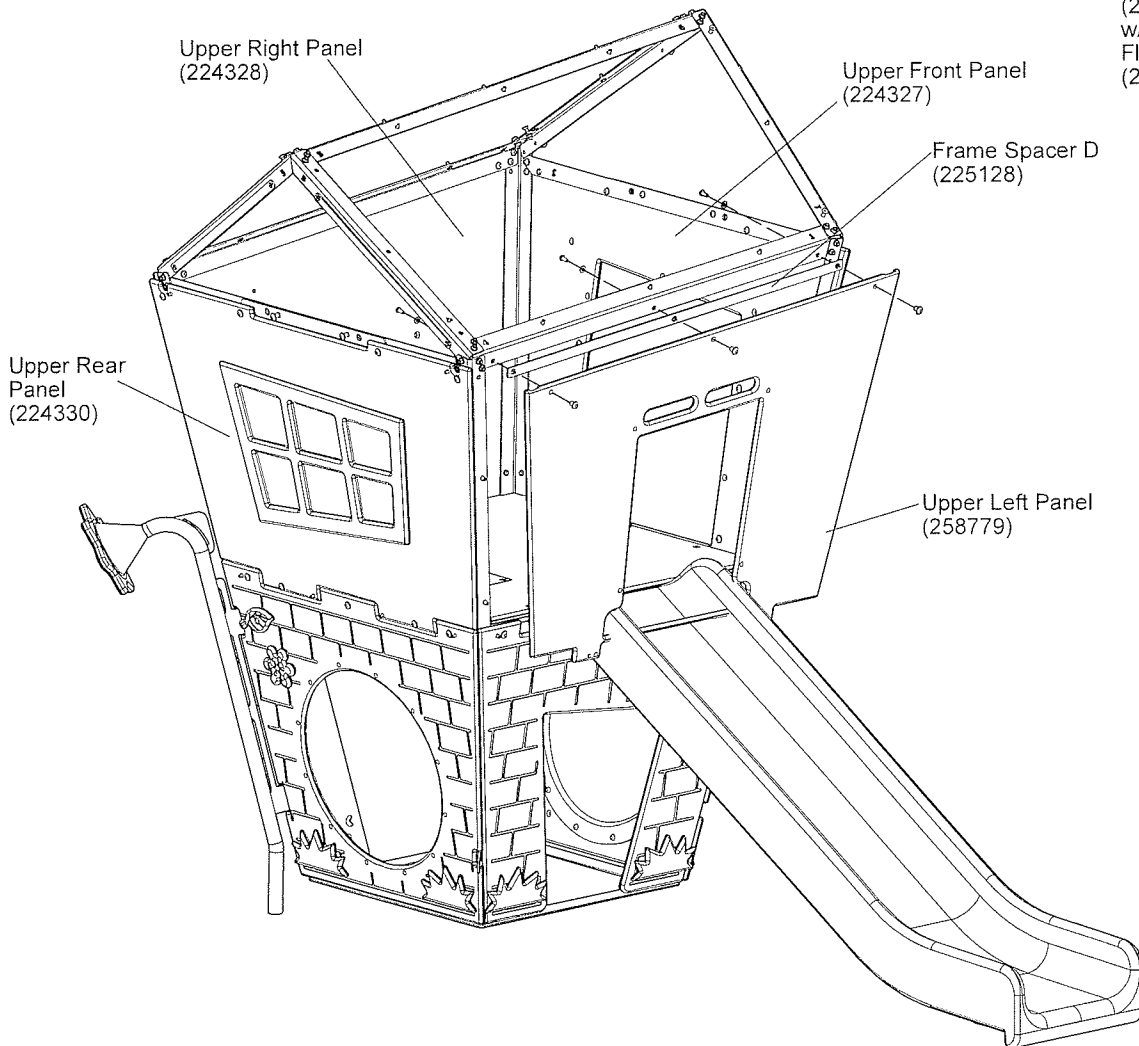
STEP 6

1) Attach upper panels.

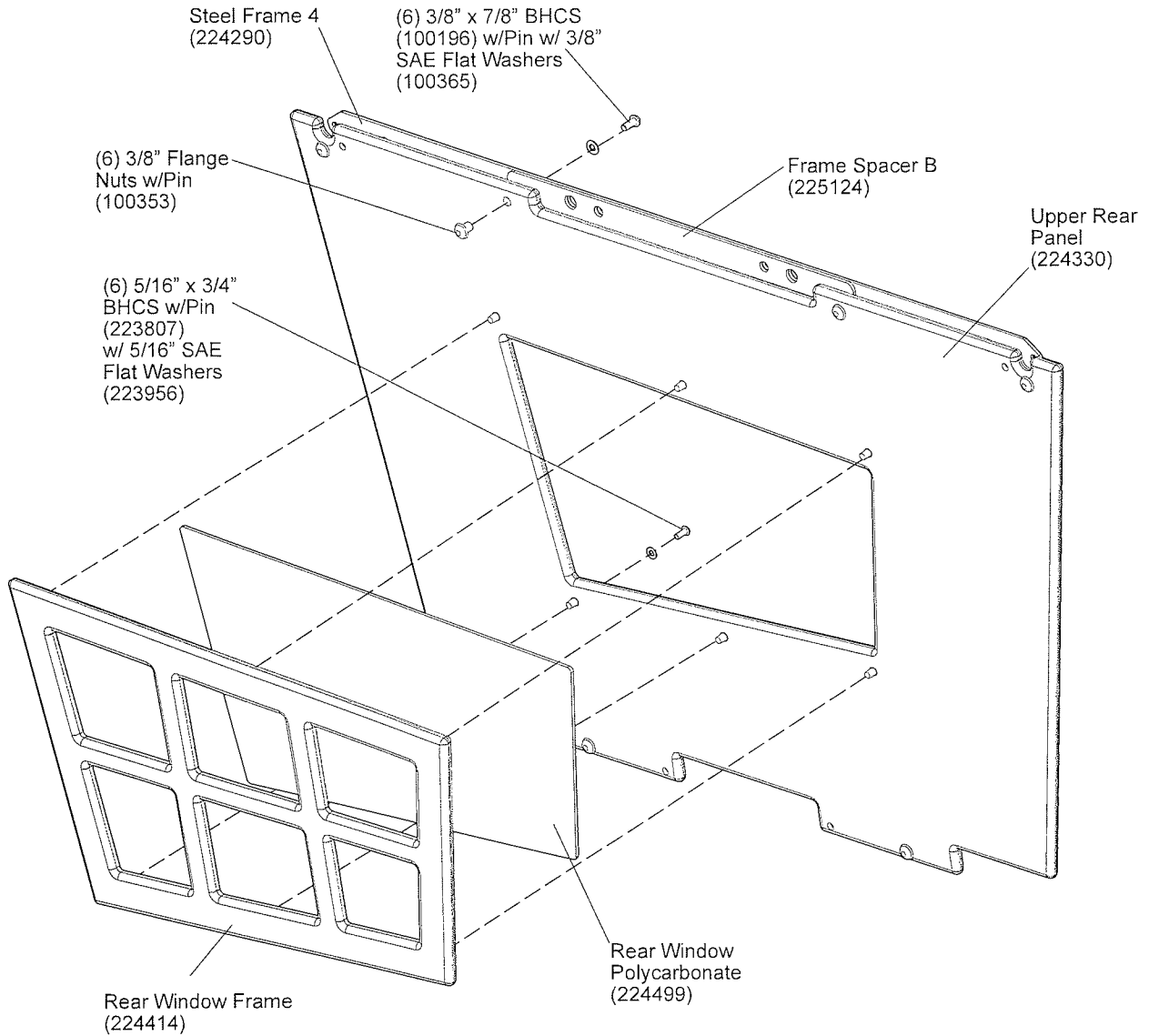
DETAIL PANEL TO FRAME ATTACHMENT (TYPICAL)



(16) 5/16" x 3/4"
 BHCS w/Pin
 (223807)
 w/ 5/16" SAE
 Flat Washers
 (223956)

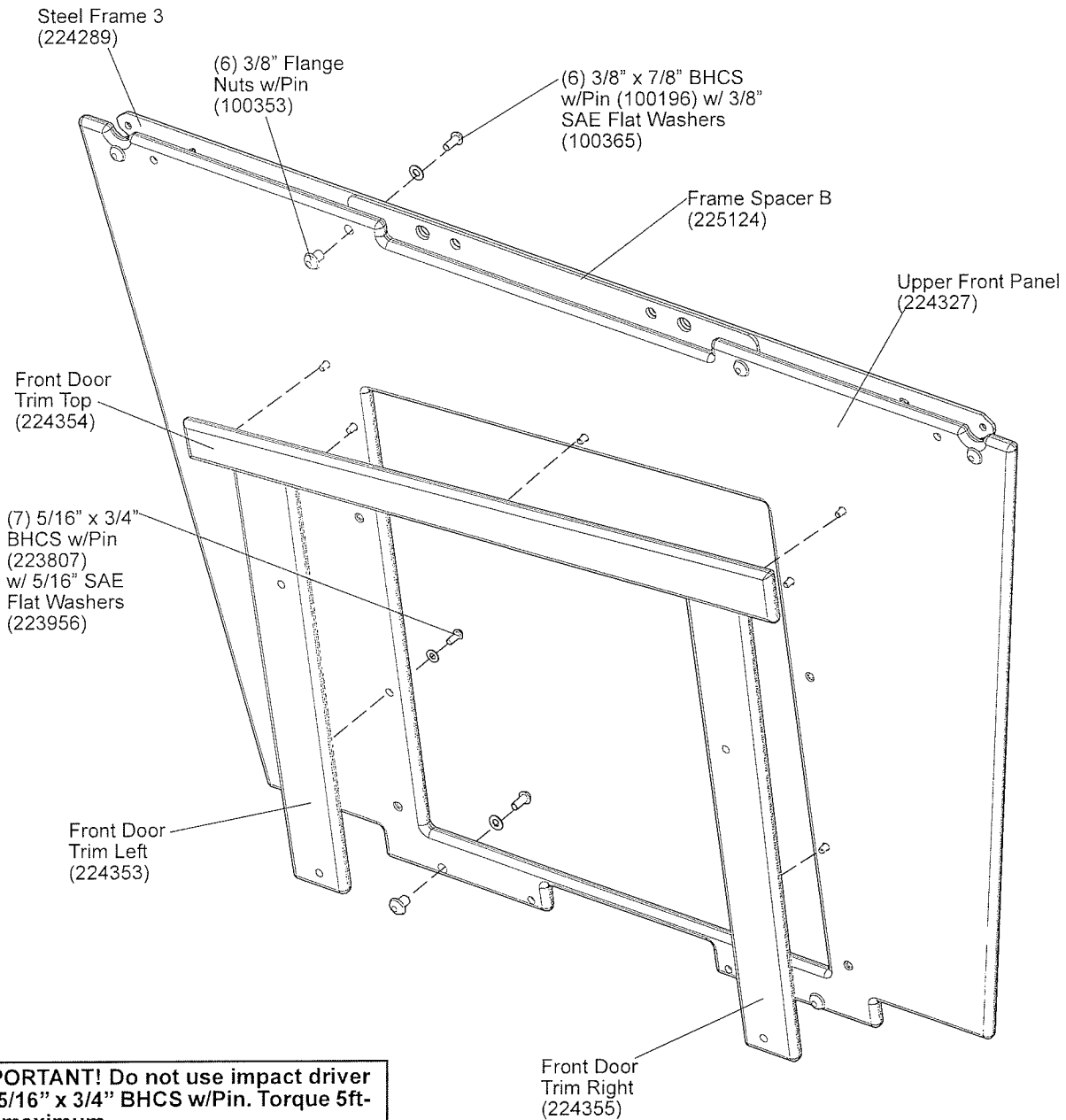


**DETAIL
WINDOW FRAME
ATTACHMENT**



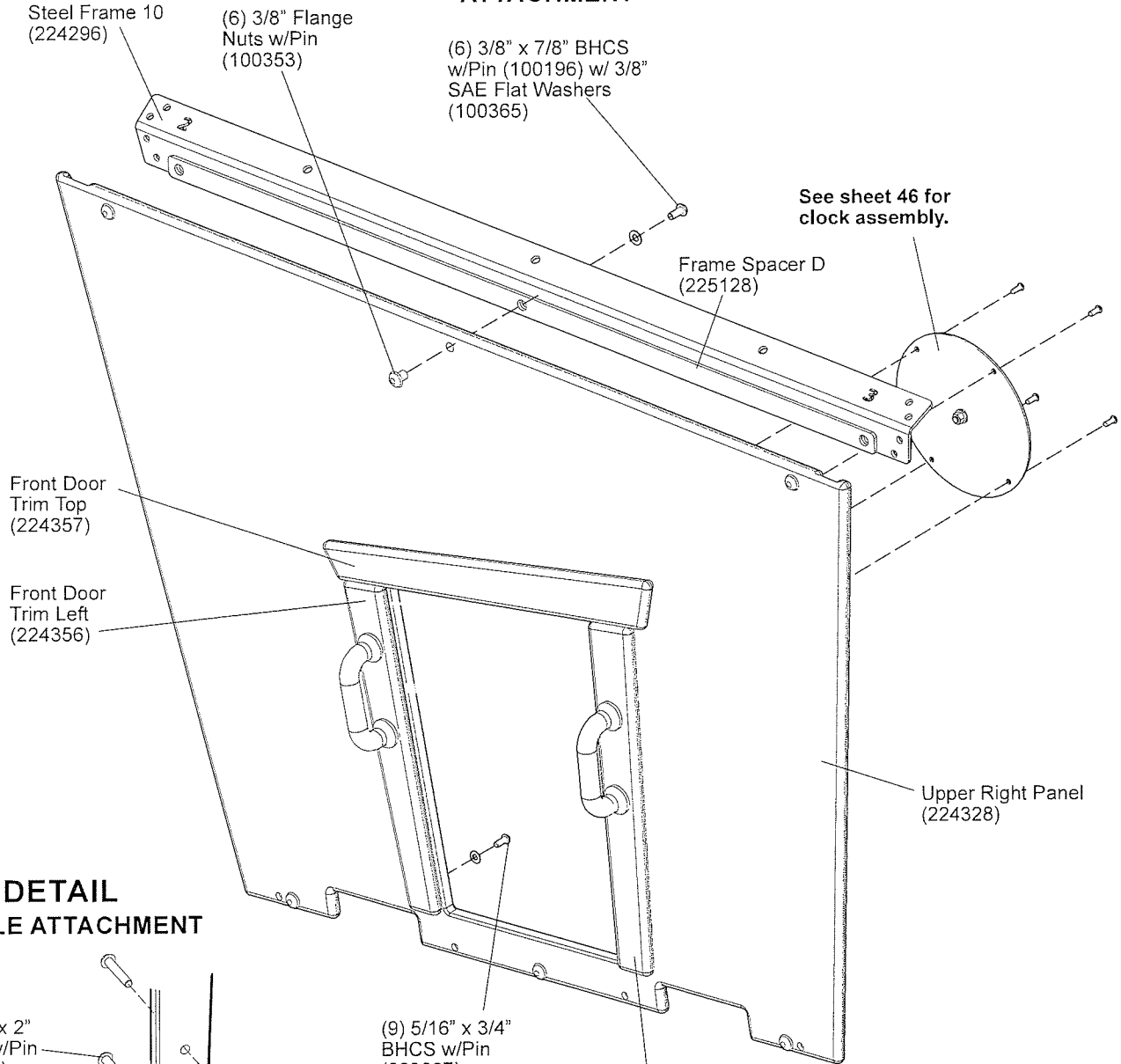
IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

**DETAIL
UPPER FRONT PANEL
ATTACHMENT**



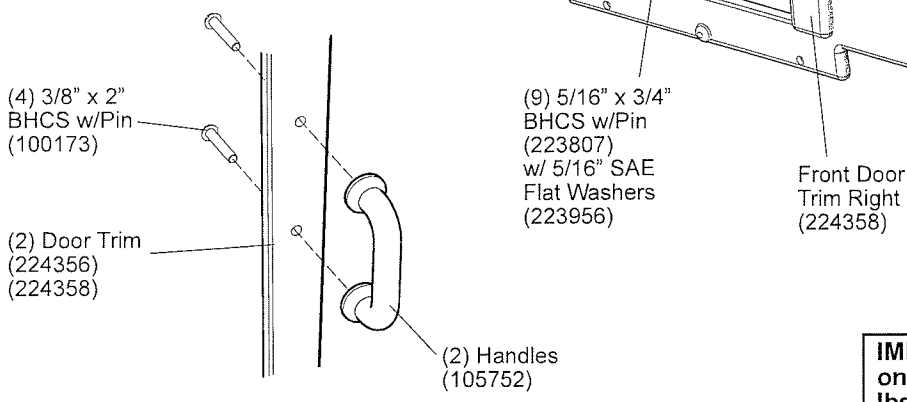
IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

**DETAIL
UPPER RIGHT PANEL
ATTACHMENT**



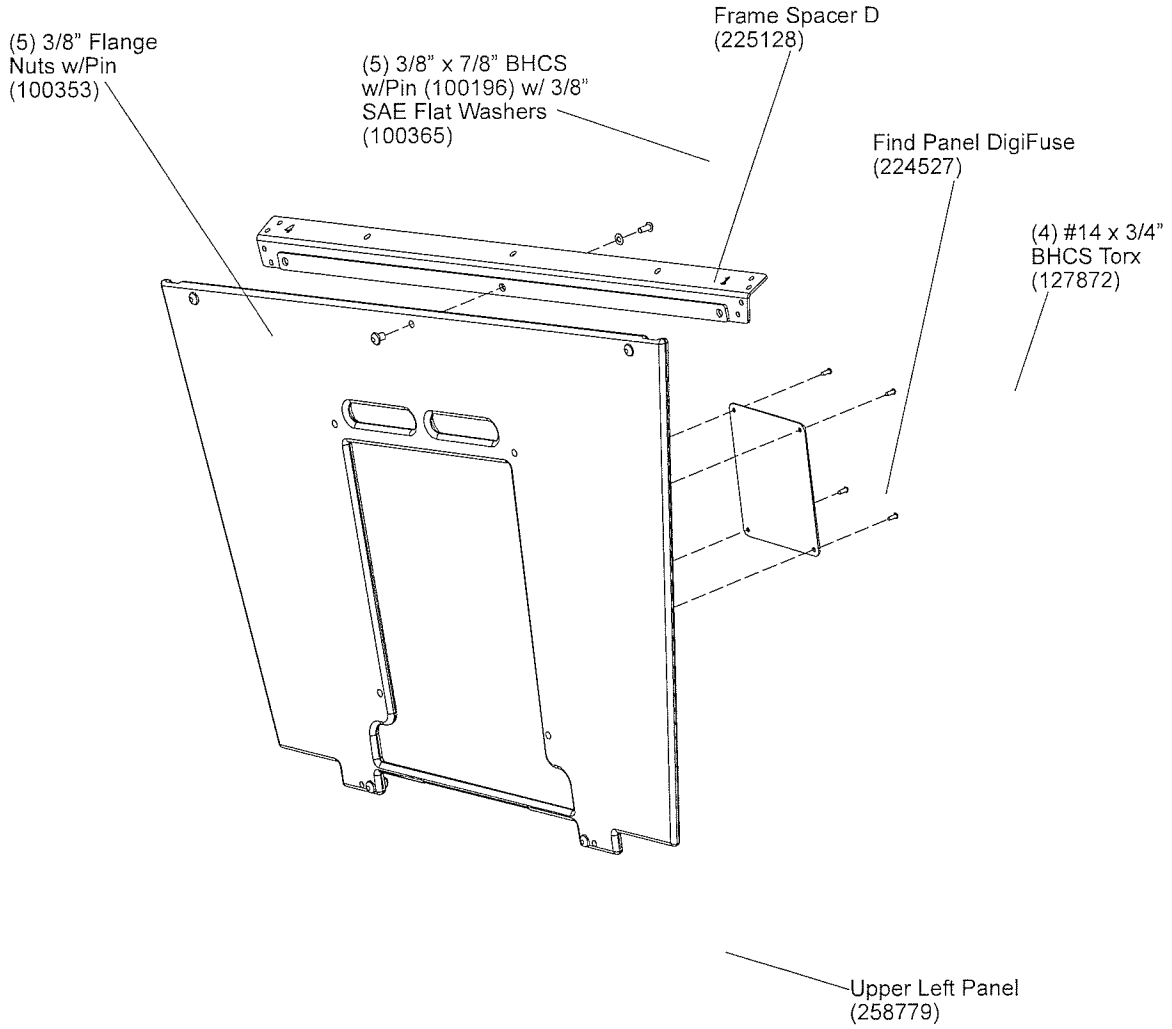
See sheet 46 for clock assembly.

**DETAIL
HANDLE ATTACHMENT**



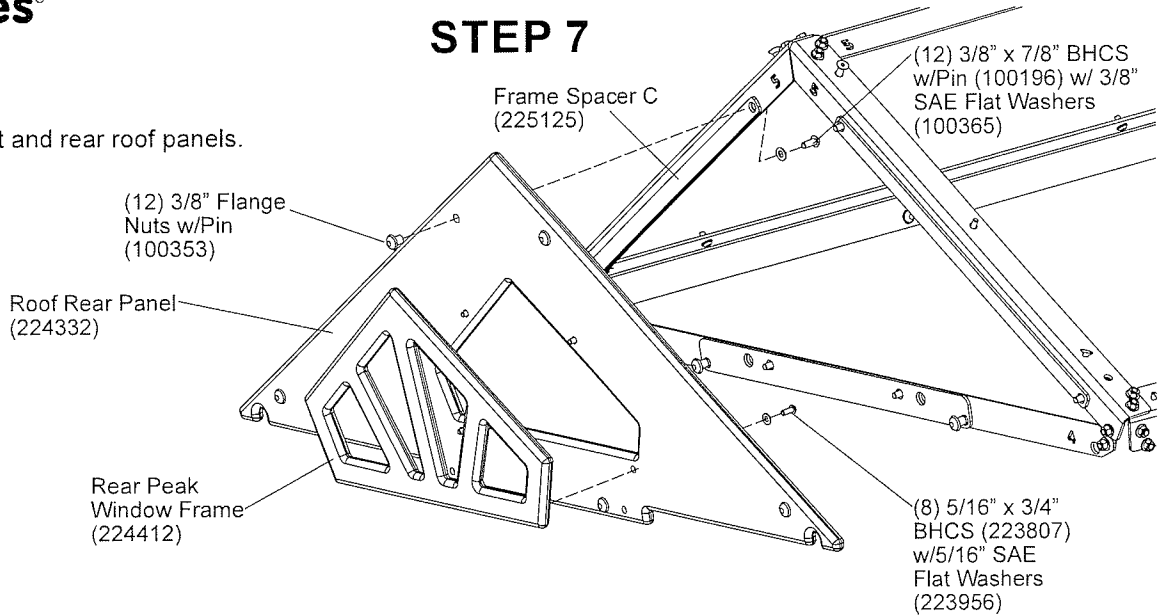
IMPORTANT! Do not use impact driver on 5/16\"/>

**DETAIL
 UPPER LEFT PANEL
 ATTACHMENT**

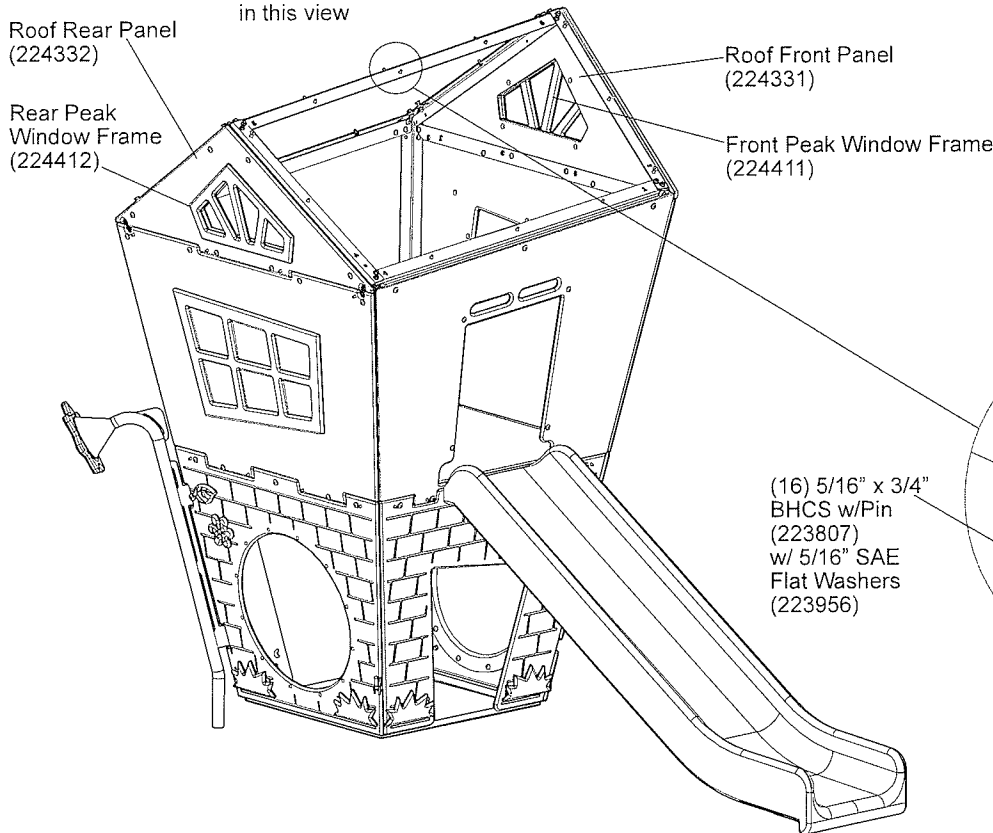


STEP 7

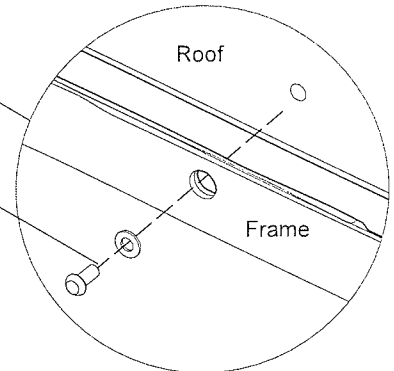
1) Attach front and rear roof panels.



Note: Roof is hidden in this view

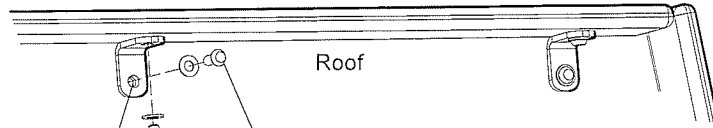


**DETAIL
ROOF ATTACHMENT
(INSIDE VIEW)**



IMPORTANT! Do not use impact driver on 5/16\"/>

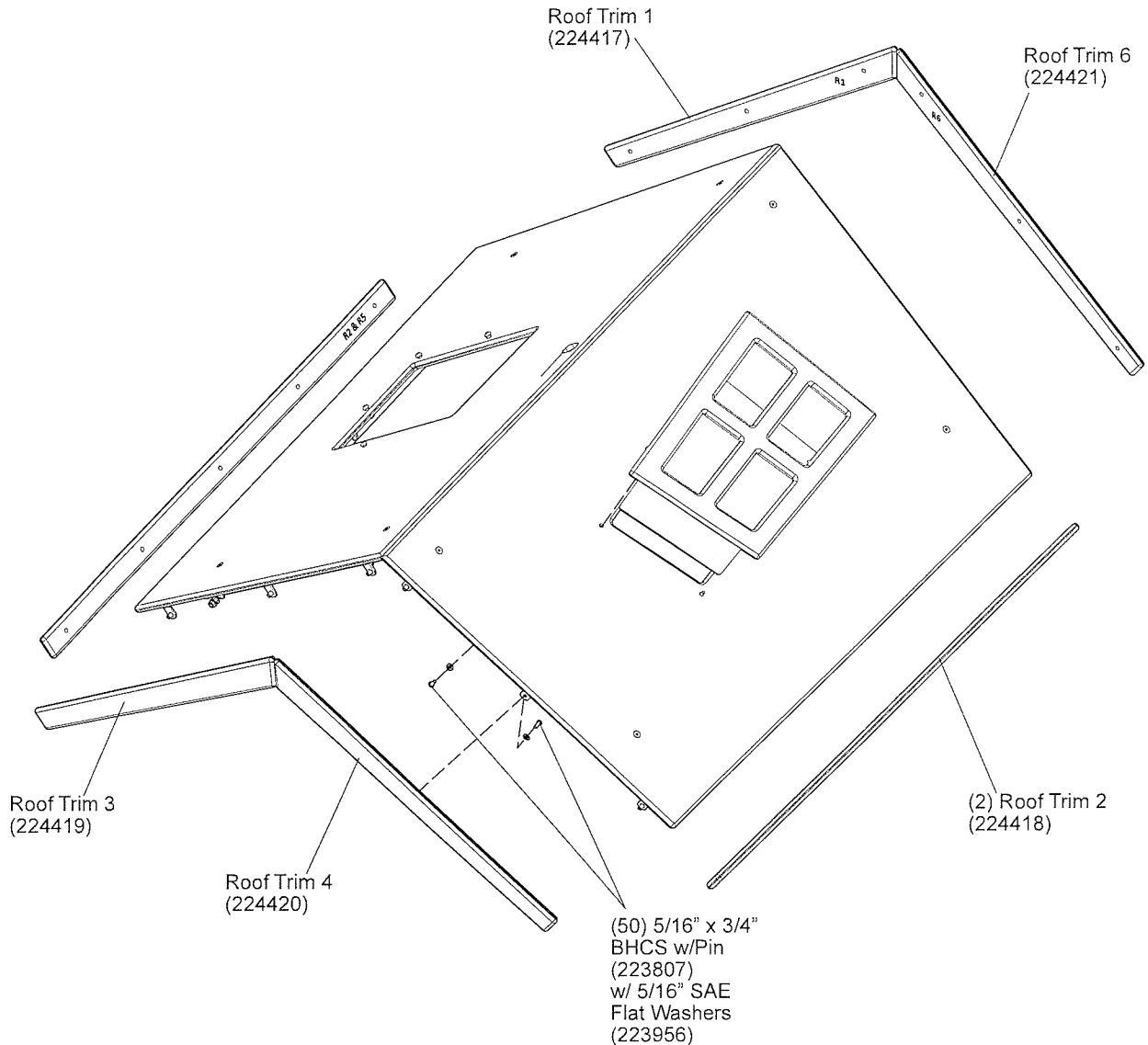
DETAIL
ROOF TRIM ATTACHMENT
(BOTTOM VIEW)



(22) 90°
 Bracket
 (223335)

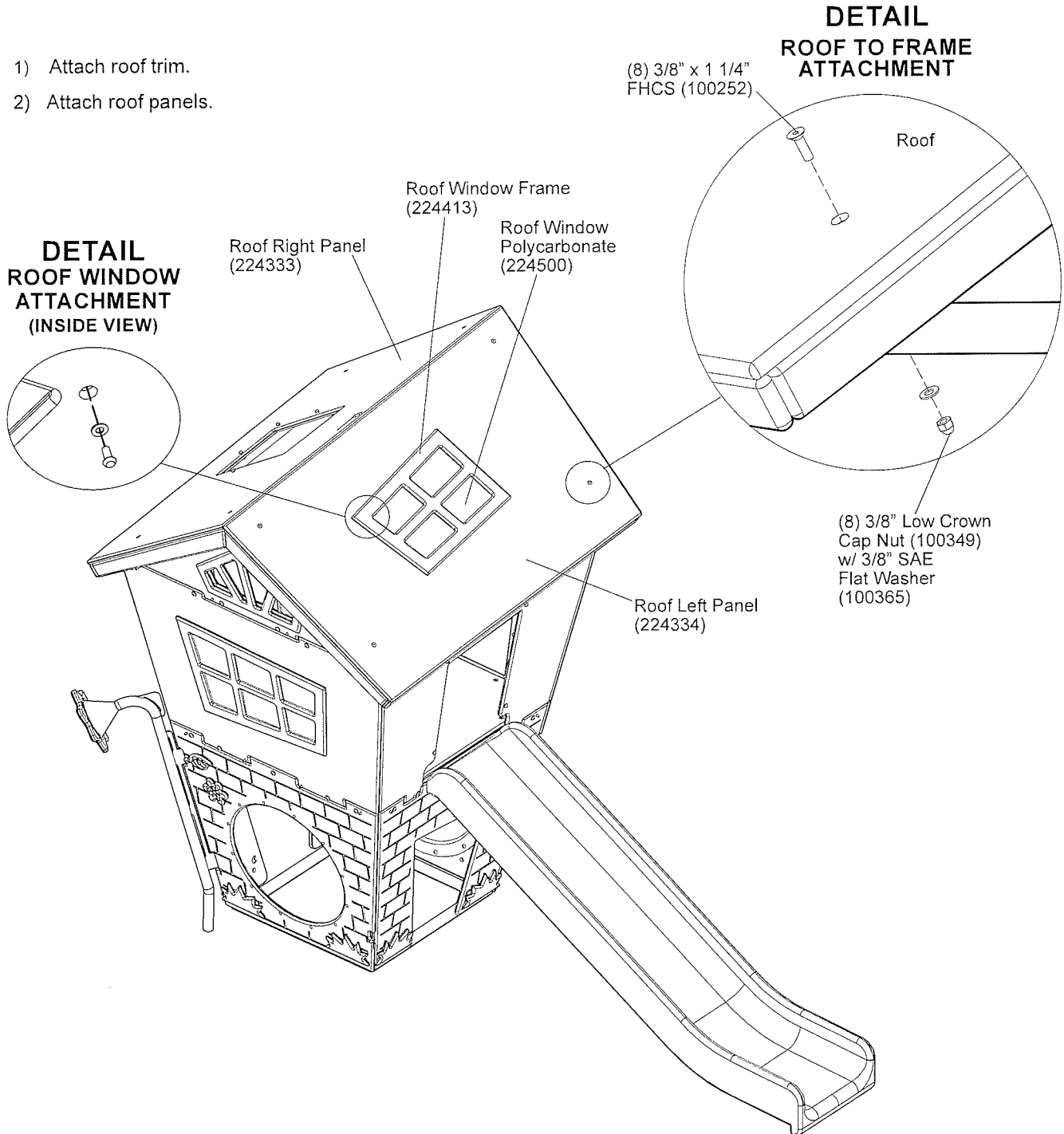
(2) 5/16" x 3/4"
 BHCS w/Pin
 (223807)
 w/ 5/16" SAE
 Flat Washers
 (223956)

IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.



STEP 8

- 1) Attach roof trim.
- 2) Attach roof panels.



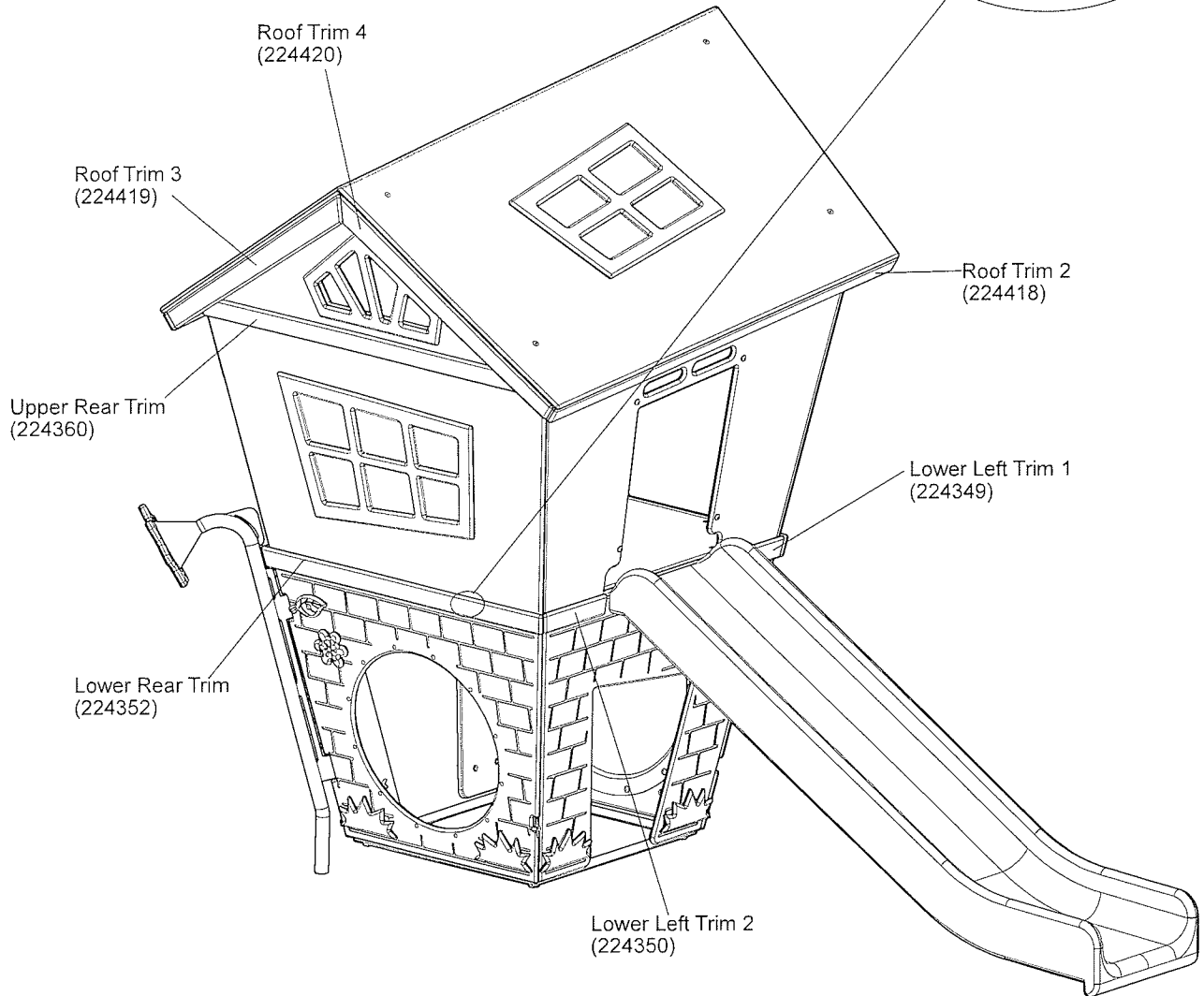
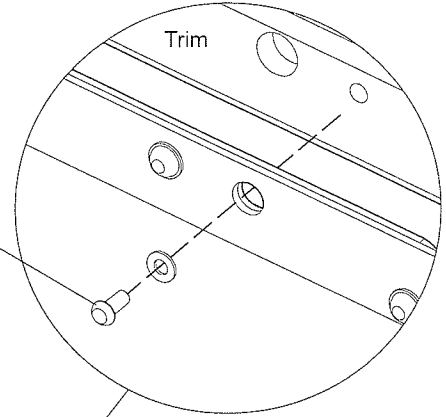
STEP 9

DETAIL TRIM ATTACHMENT (INSIDE VIEW)

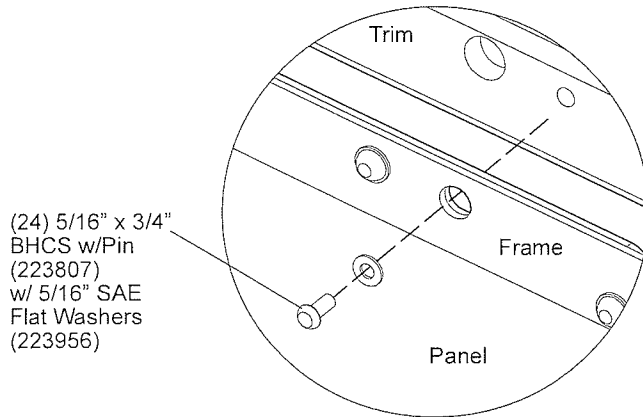
1) Attach trim.

IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

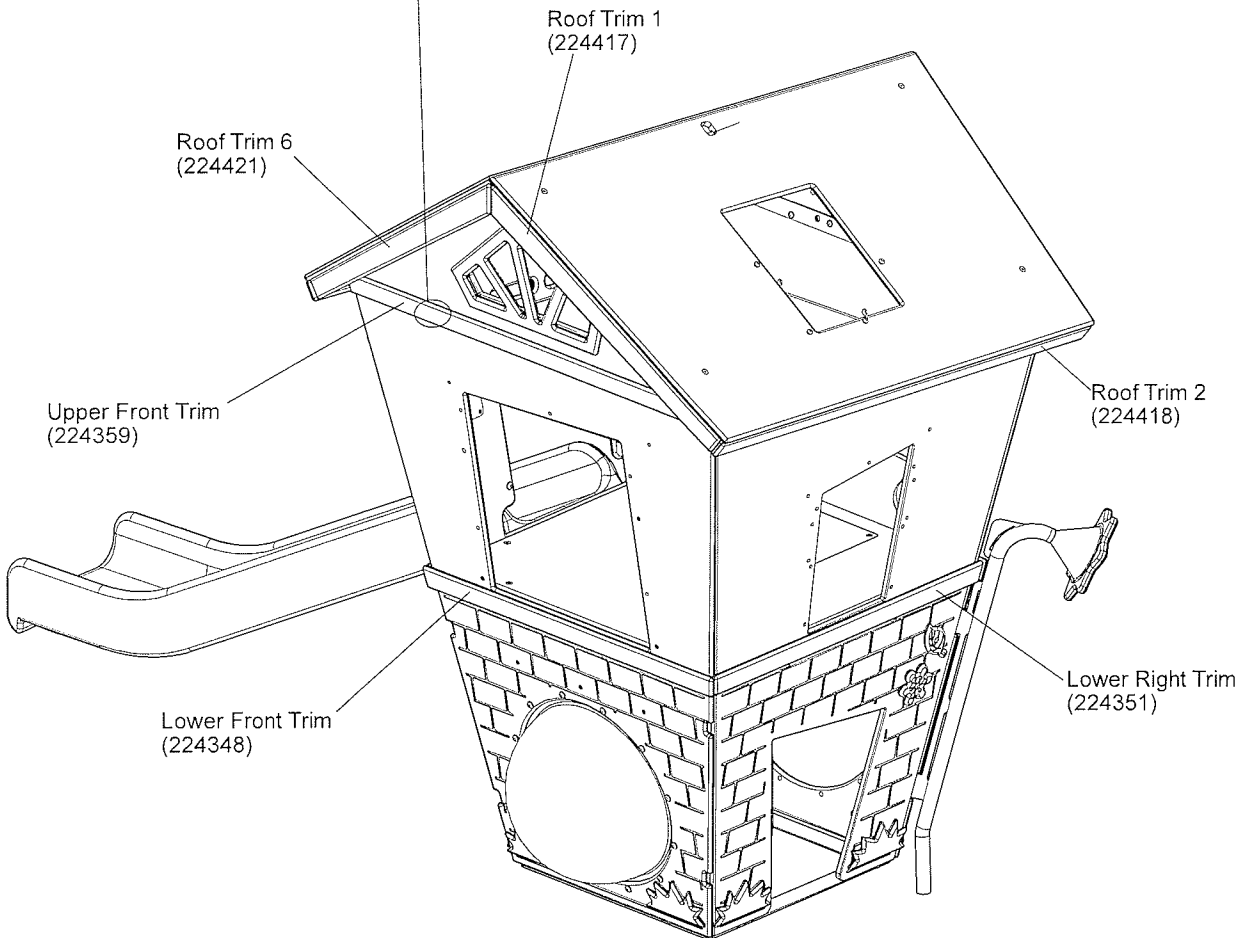
(24) 5/16" x 3/4"
BHCS w/Pin
(223807)
w/ 5/16" SAE
Flat Washers
(223956)



**DETAIL
TRIM ATTACHMENT
(INSIDE VIEW)**



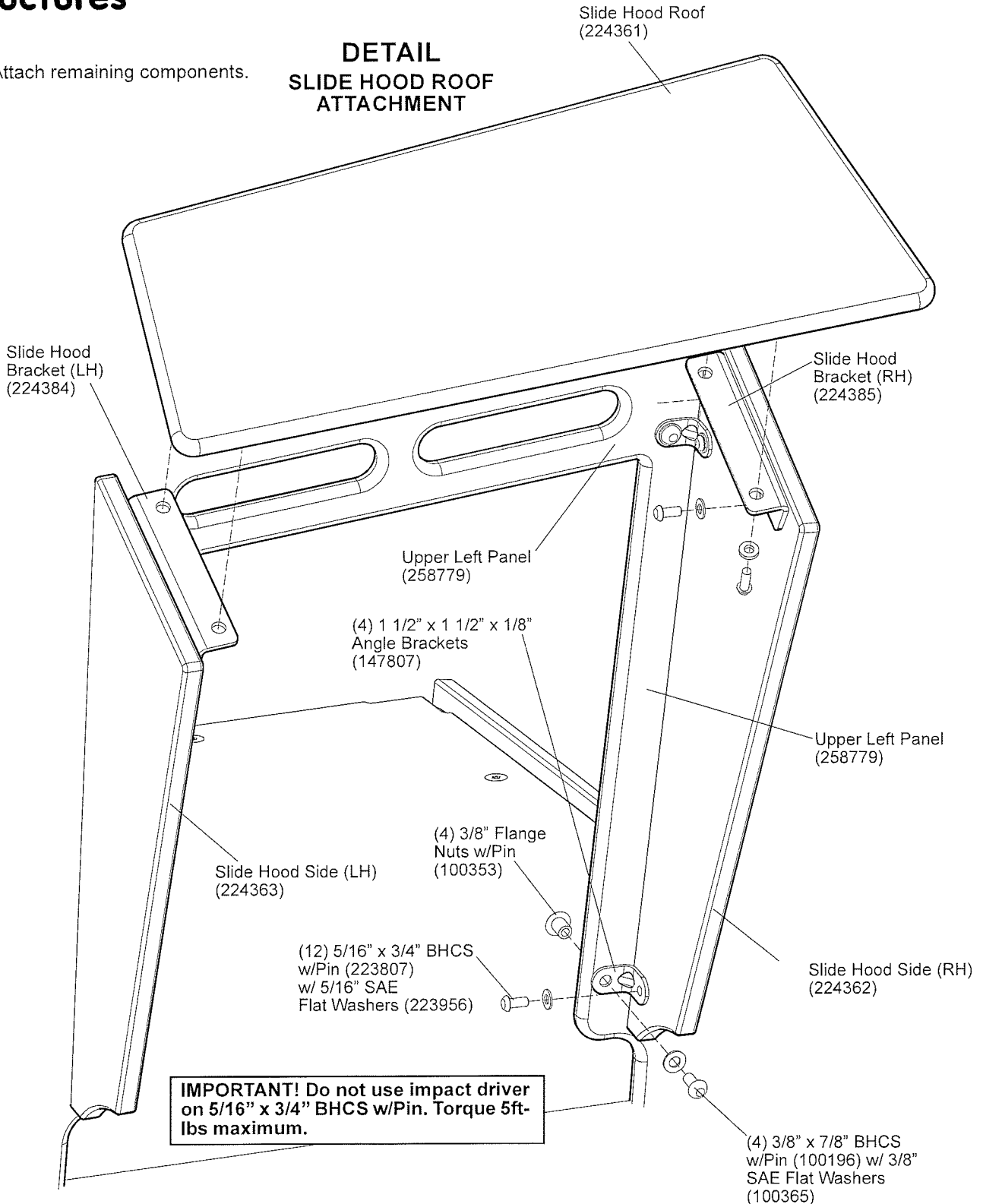
IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

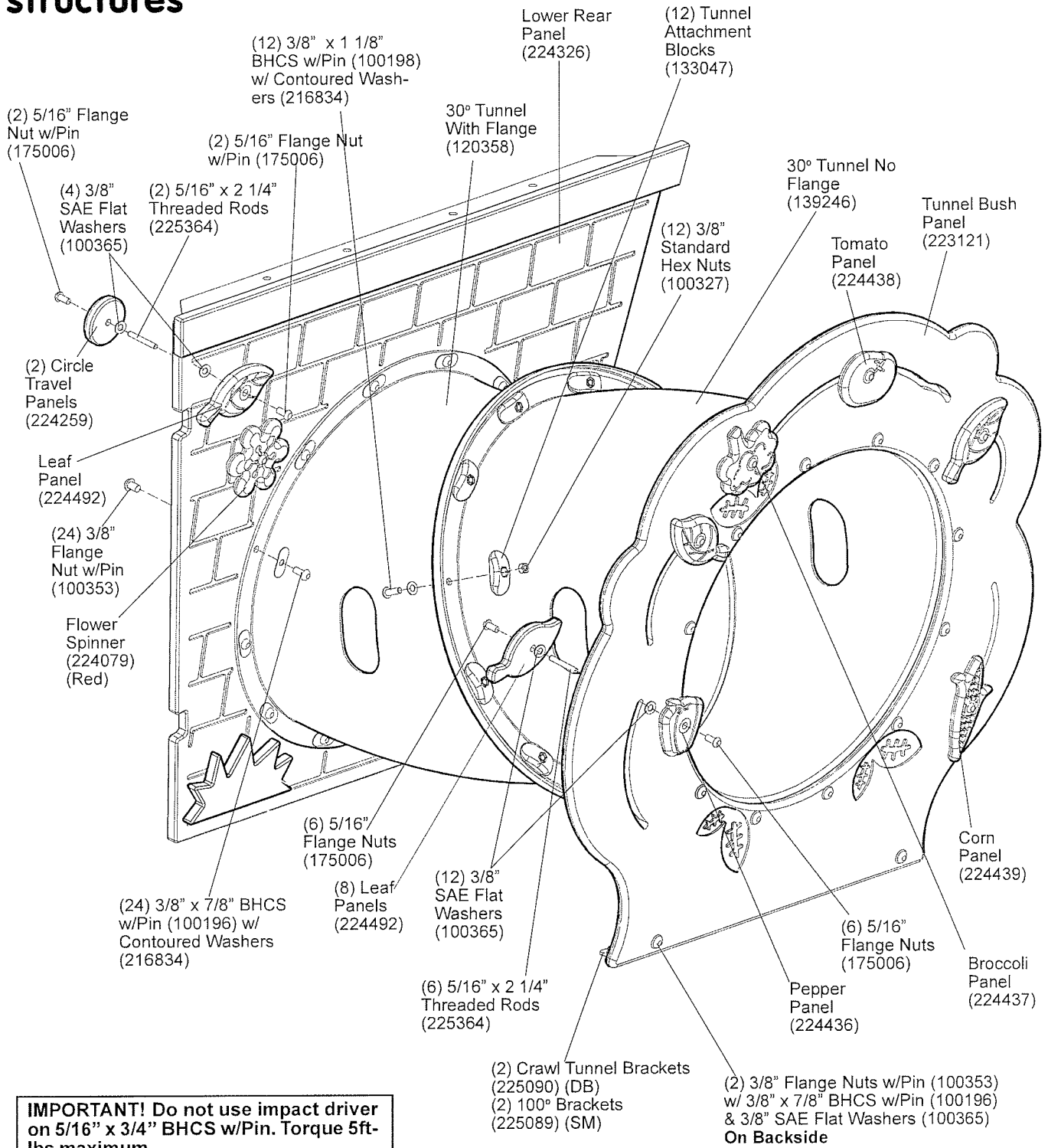


STEP 10

1) Attach remaining components.

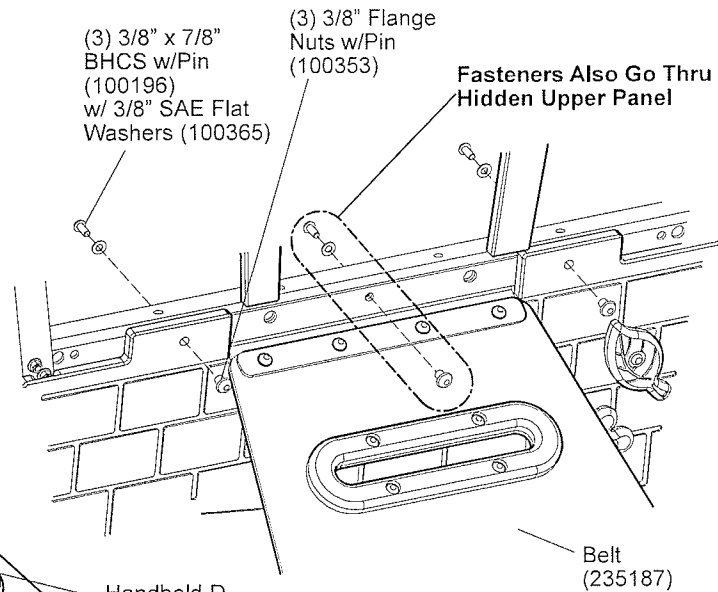
DETAIL SLIDE HOOD ROOF ATTACHMENT



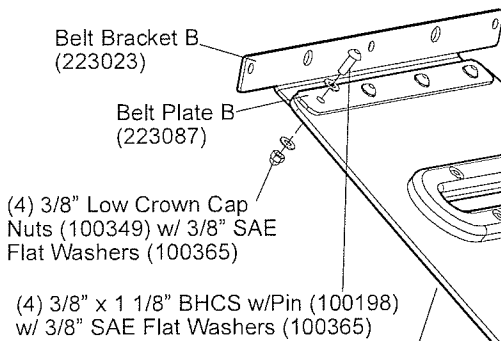


IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

**DETAIL
BELT CLIMBER ATTACHMENT**

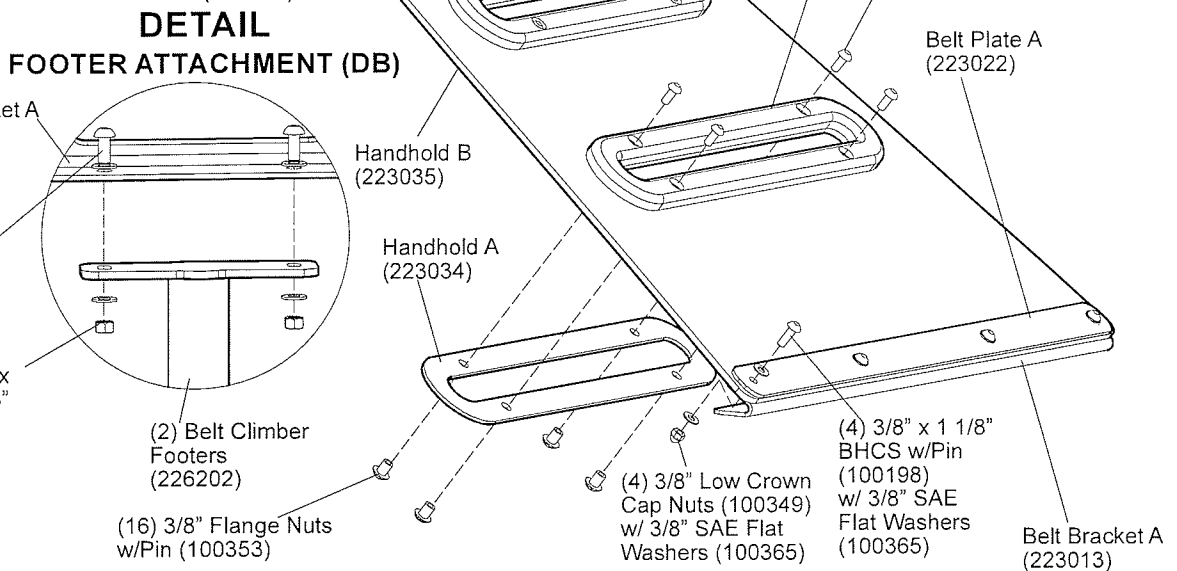
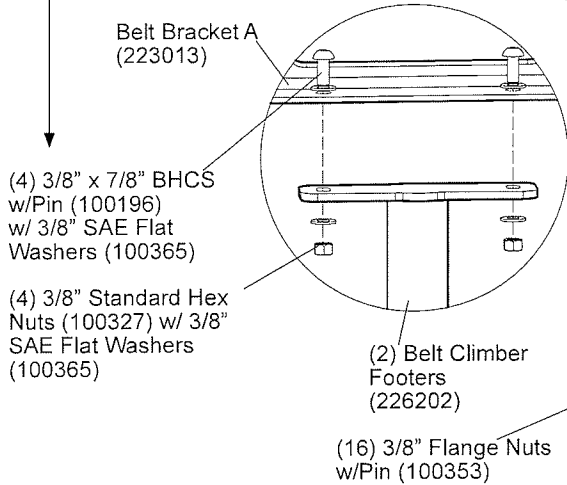


**DETAIL
BELT CLIMBER ASSEMBLY**

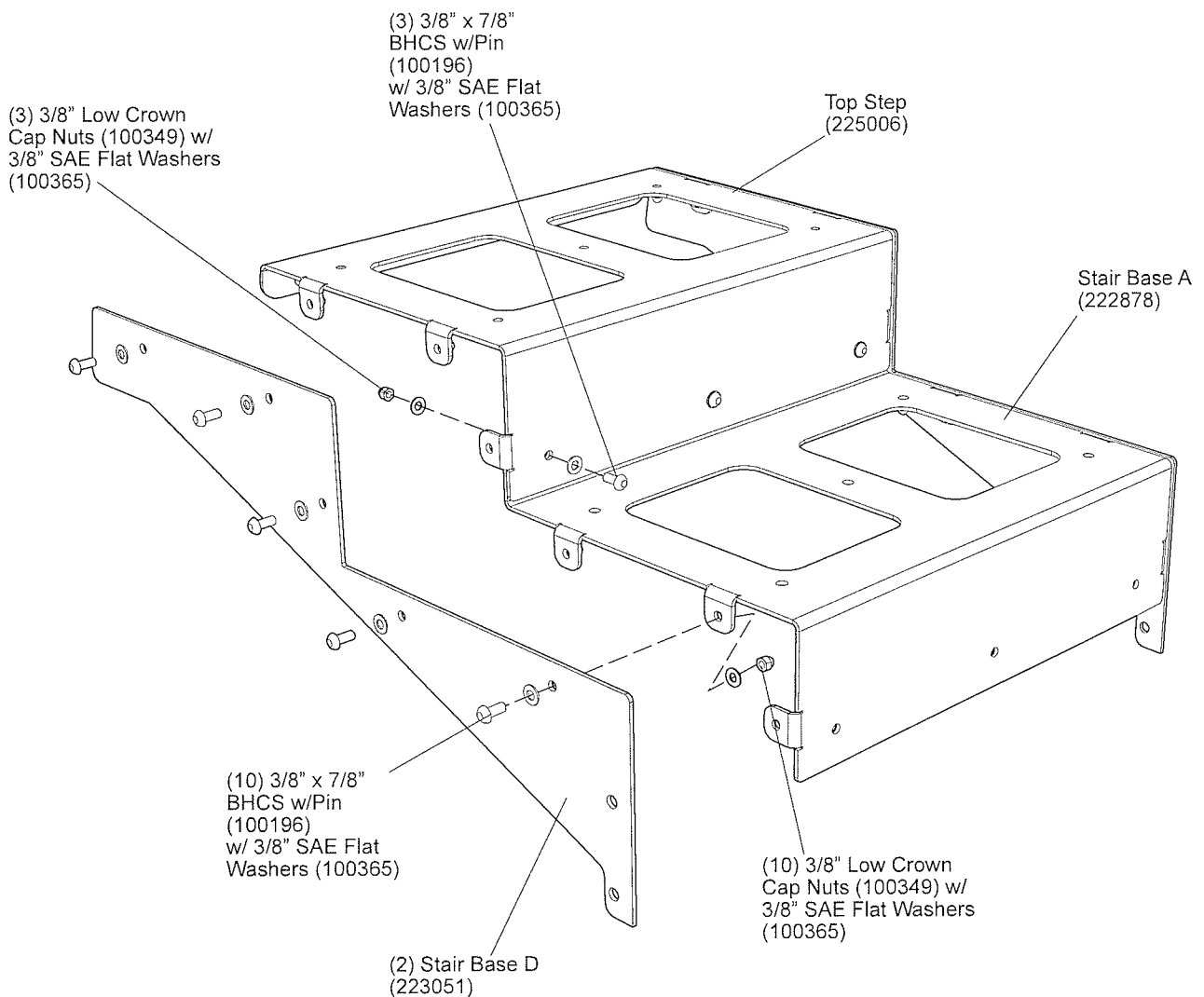


**DETAIL
FOOTER ATTACHMENT (DB)**

Note: Not used in SM configuration. Discard unused hardware

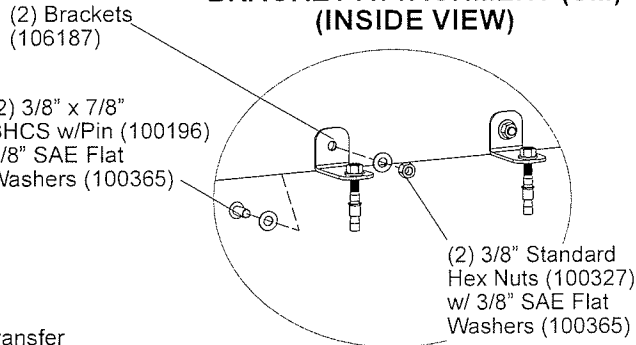


DETAIL
UPPER STAIR BASE ASSEMBLY

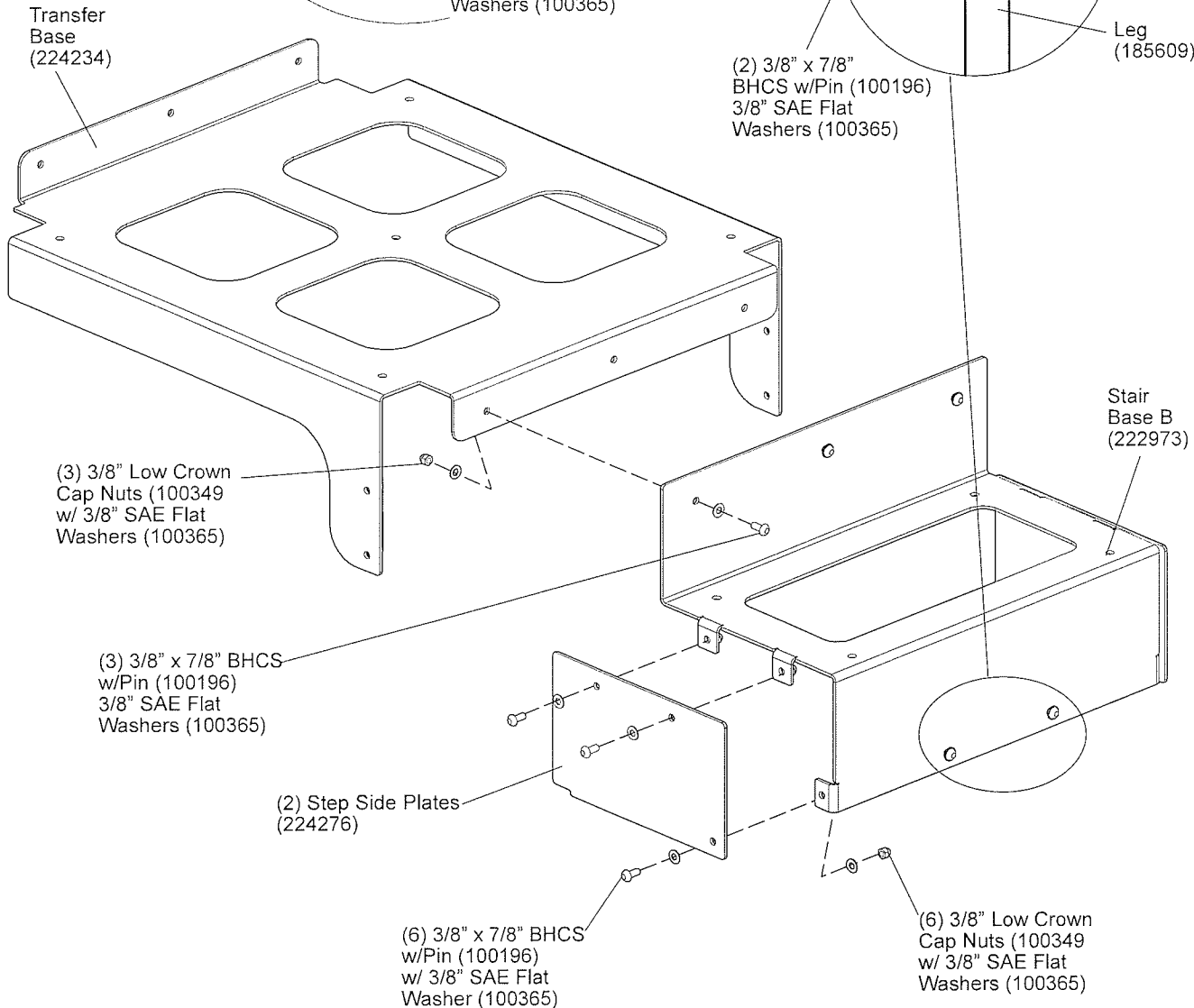
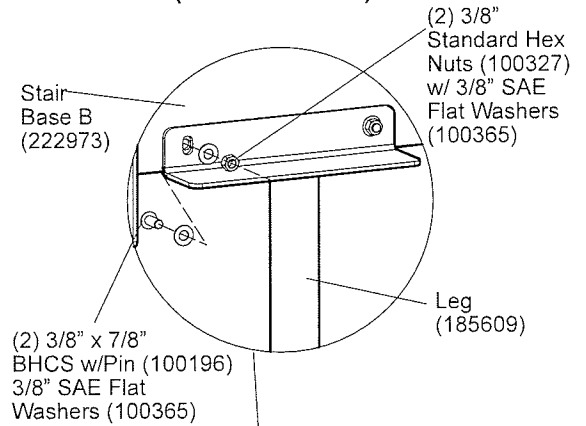


DETAIL
LOWER STAIR BASE ASSEMBLY

DETAIL
BRACKET ATTACHMENT (SM)
(INSIDE VIEW)

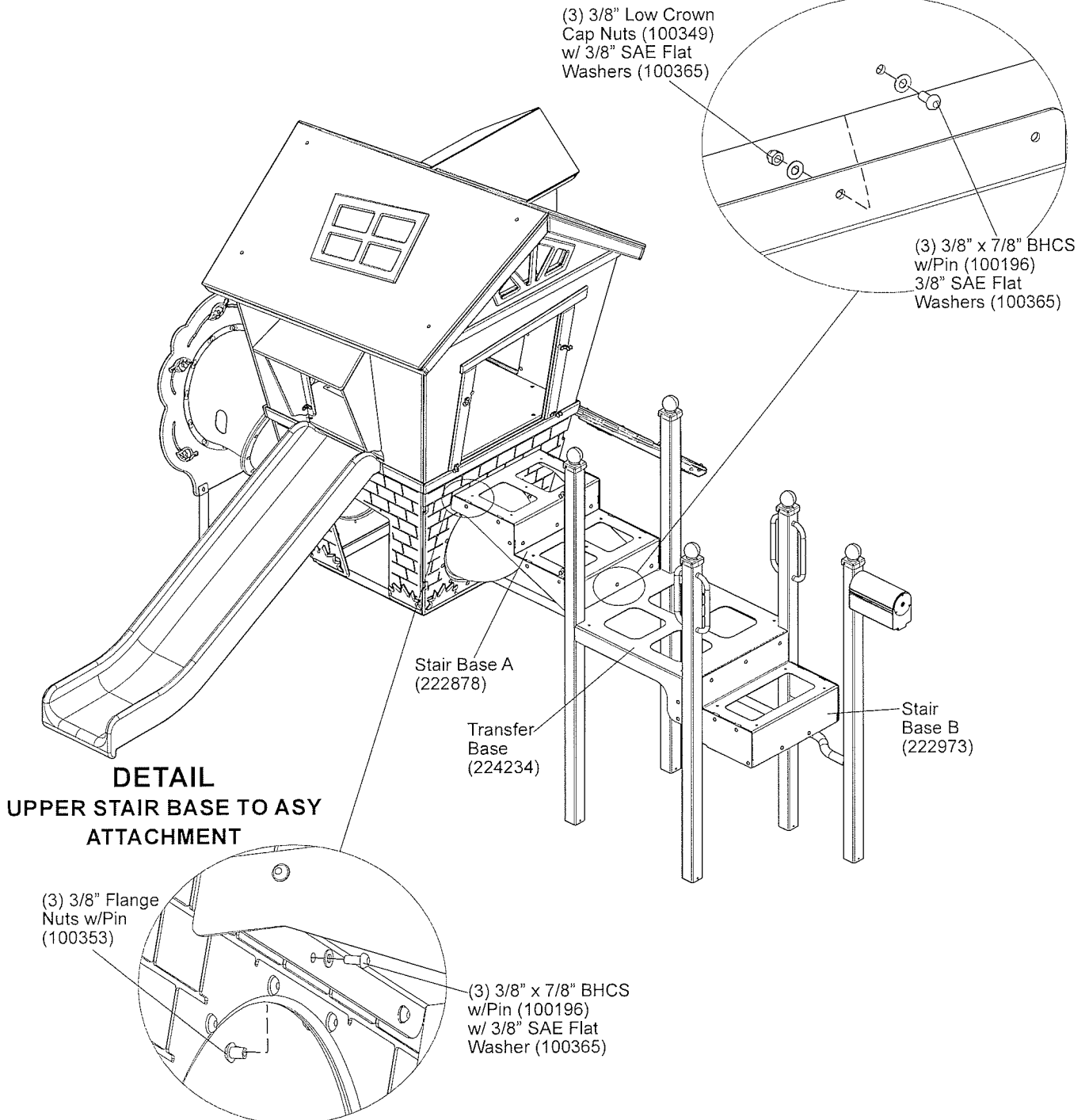


DETAIL
LEG ATTACHMENT (DB)
(INSIDE VIEW)

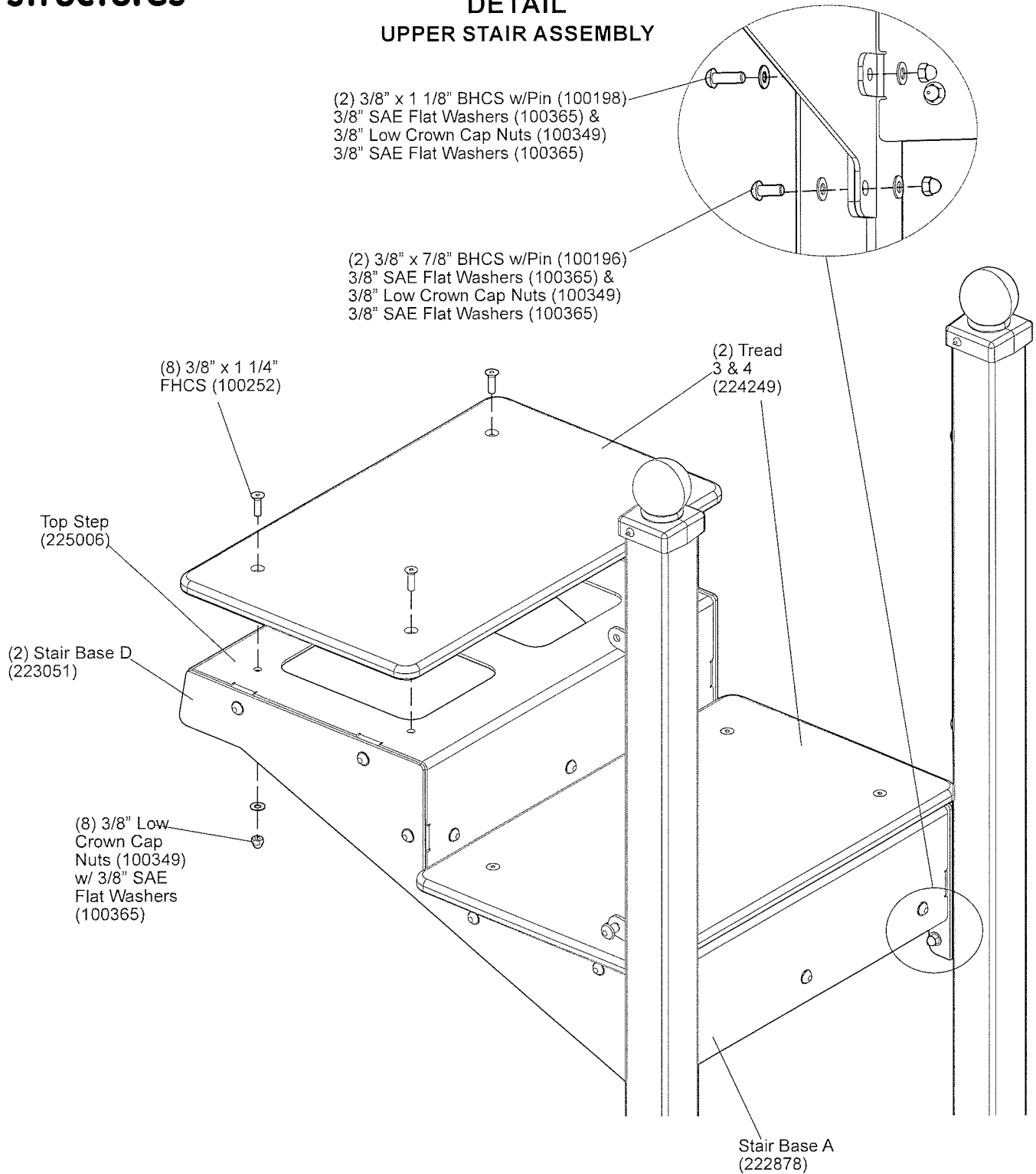


**DETAIL
UPPER & LOWER STAIR BASE
ASSEMBLY**

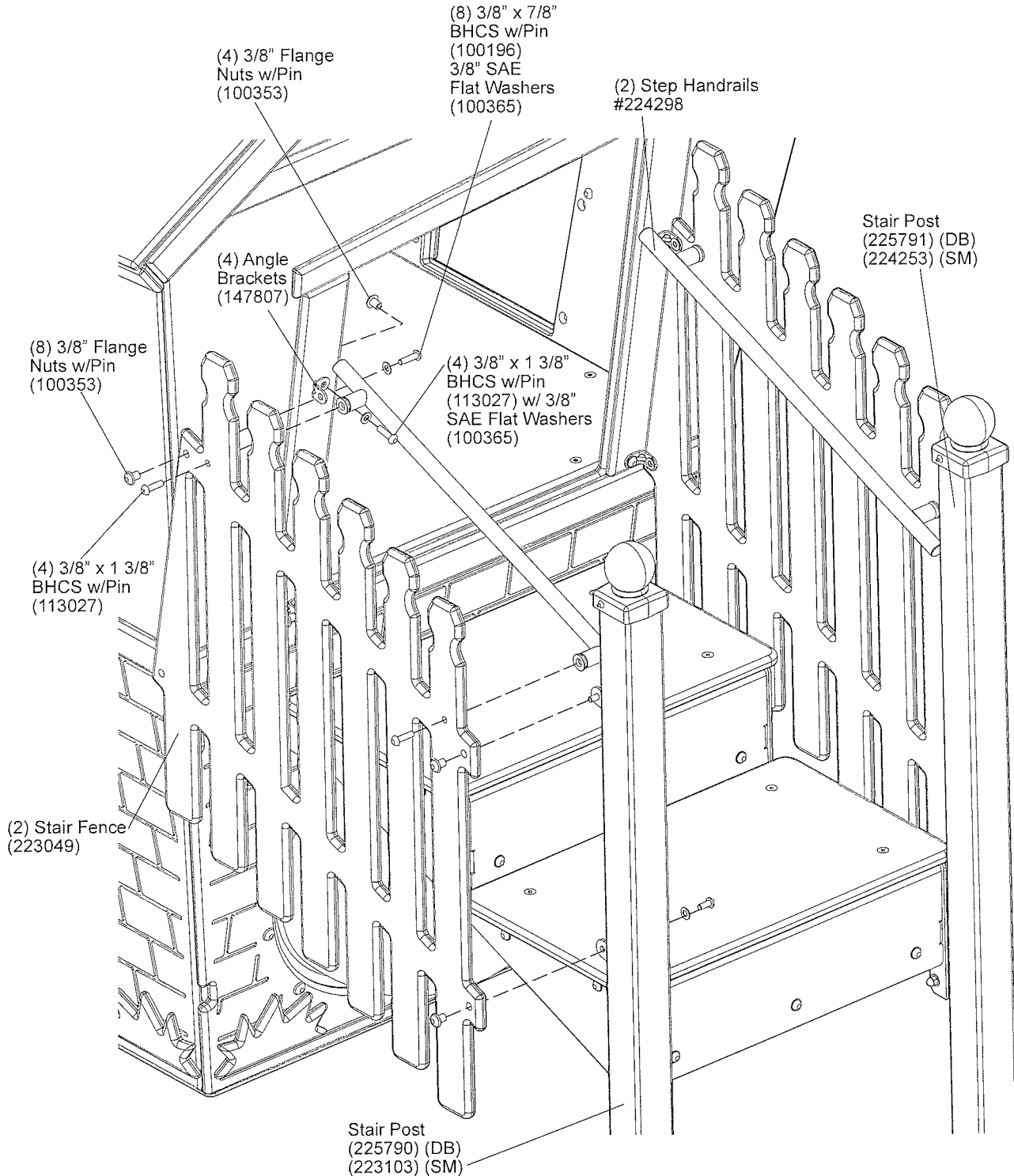
**DETAIL
UPPER & LOWER STAIR BASE
ATTACHMENT**



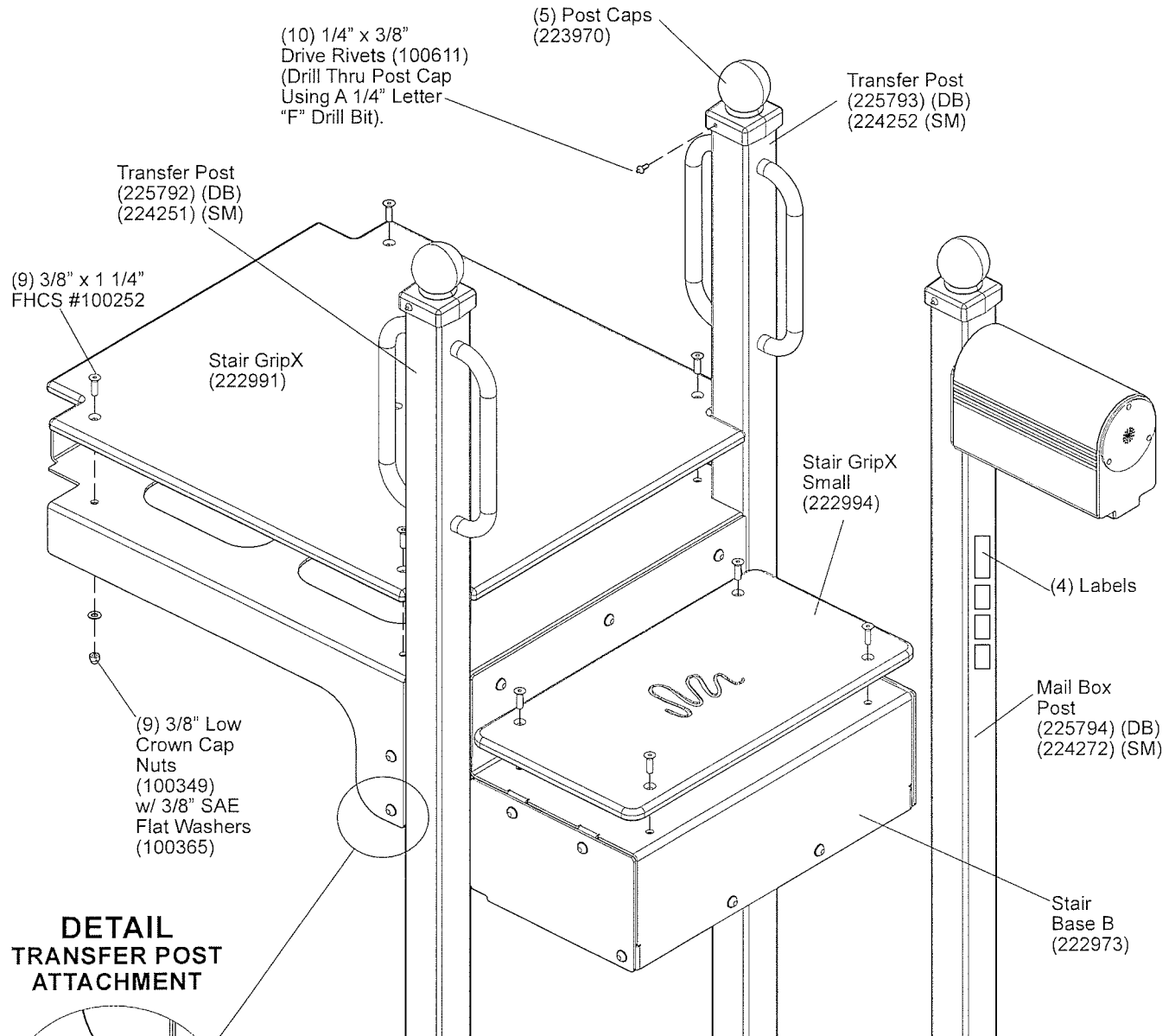
**DETAIL
UPPER STAIR ASSEMBLY**



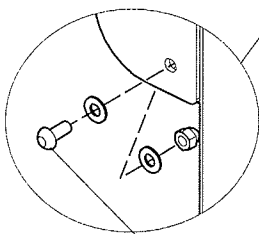
**DETAIL
FENCE ASSEMBLY**



**DETAIL
LOWER STAIR ASSEMBLY**

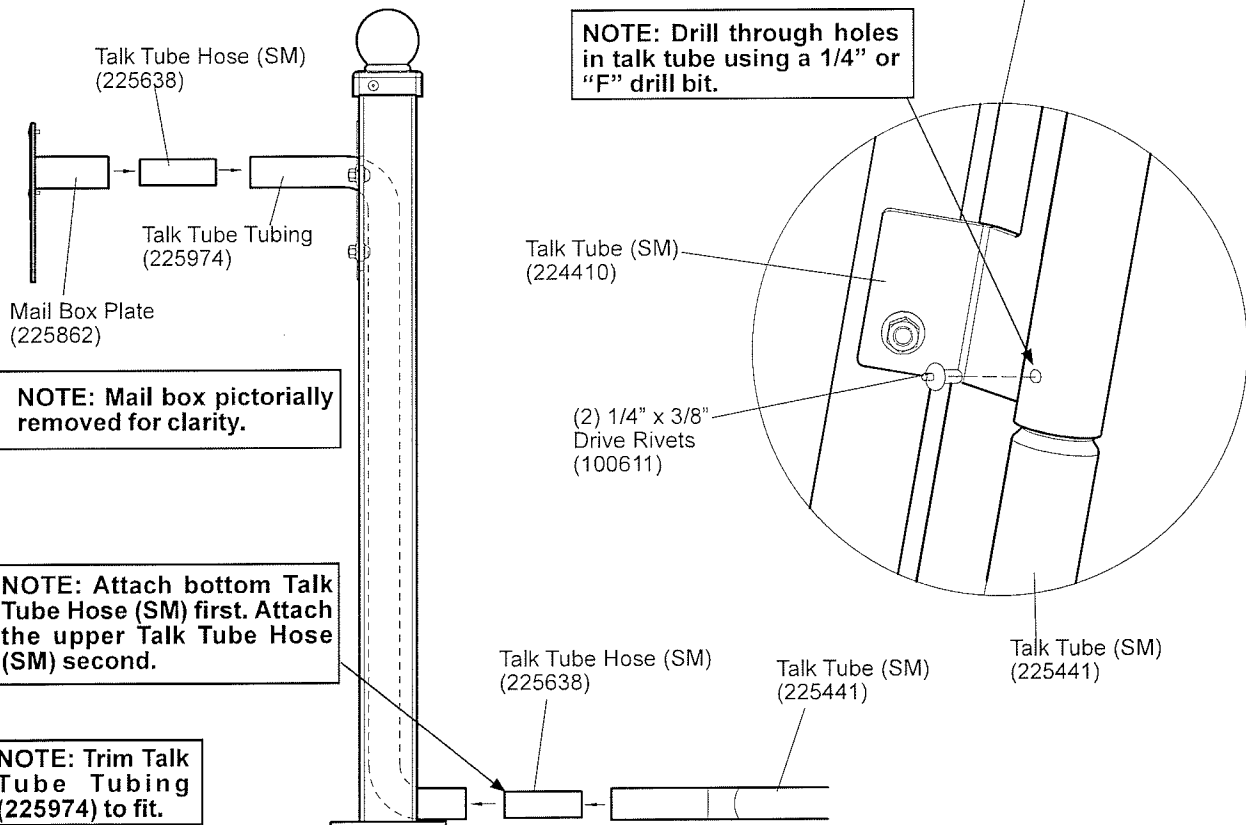
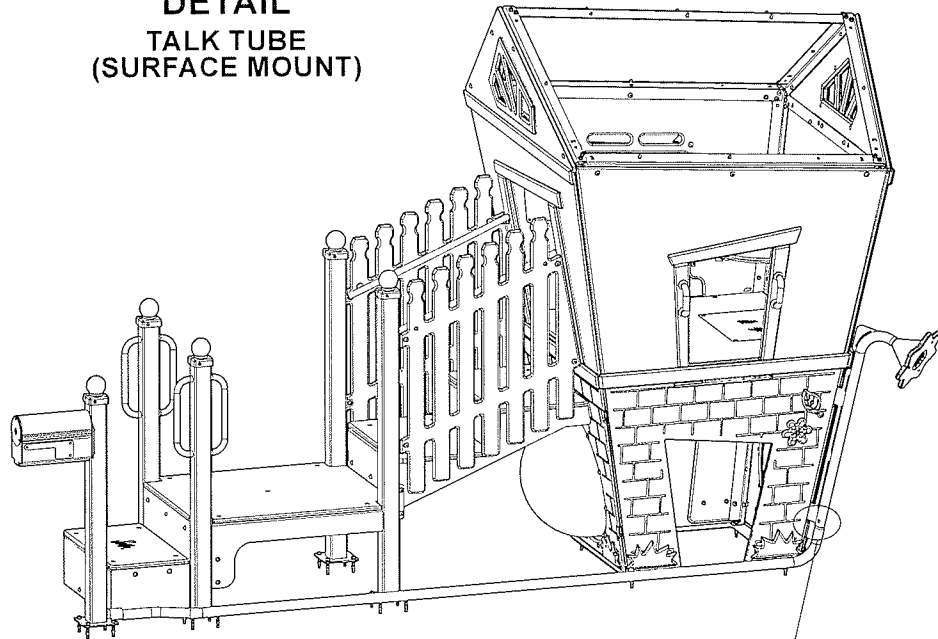


**DETAIL
TRANSFER POST
ATTACHMENT**



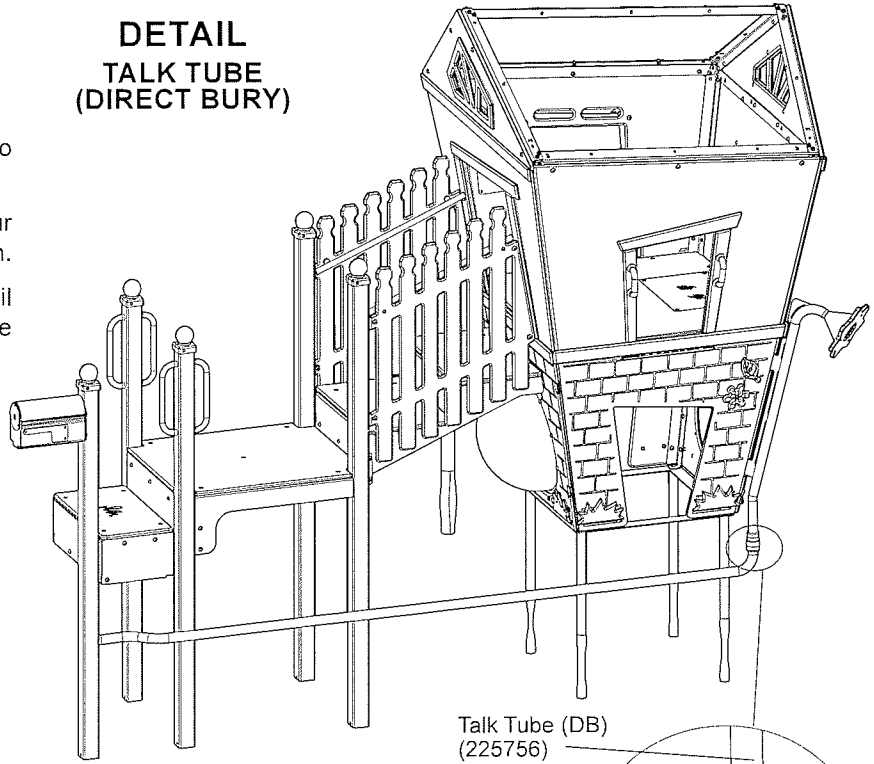
- (4) 3/8" x 7/8" BHCS w/Pin (100196)
- 3/8" SAE Flat Washers (100365) &
- 3/8" Low Crown Cap Nuts (100349)
- 3/8" SAE Flat Washers (100365)

**DETAIL
TALK TUBE
(SURFACE MOUNT)**



**DETAIL
TALK TUBE
(DIRECT BURY)**

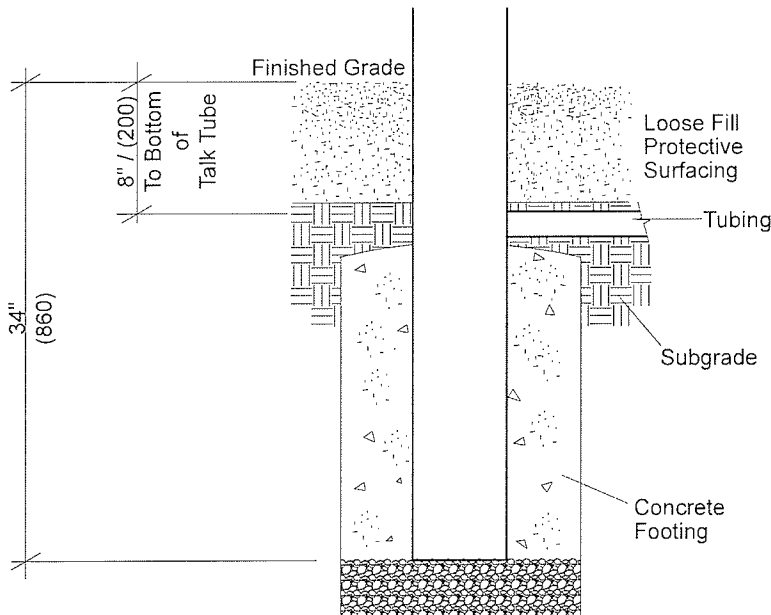
- 1) Dig a trench into subgrade between the two footings for placement of plastic tubing.
- 2) Cut plastic tubing to correct length for your installation, lay plastic tubing flat in trench.
- 3) Connect plastic tubing to talk tube and mail box plate with rubber couplings and hose clamps.
- 4) Backfill trench to top of subgrade.



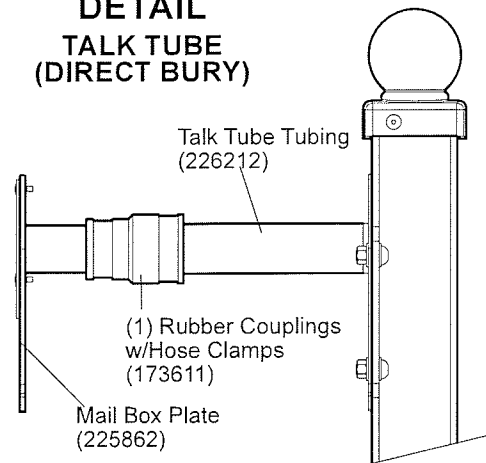
Talk Tube (DB)
(225756)

(1) Rubber Couplings
w/Hose Clamps
(173611)

Talk Tube Tubing (DB)
(226212)



**DETAIL
TALK TUBE
(DIRECT BURY)**



Talk Tube Tubing
(226212)

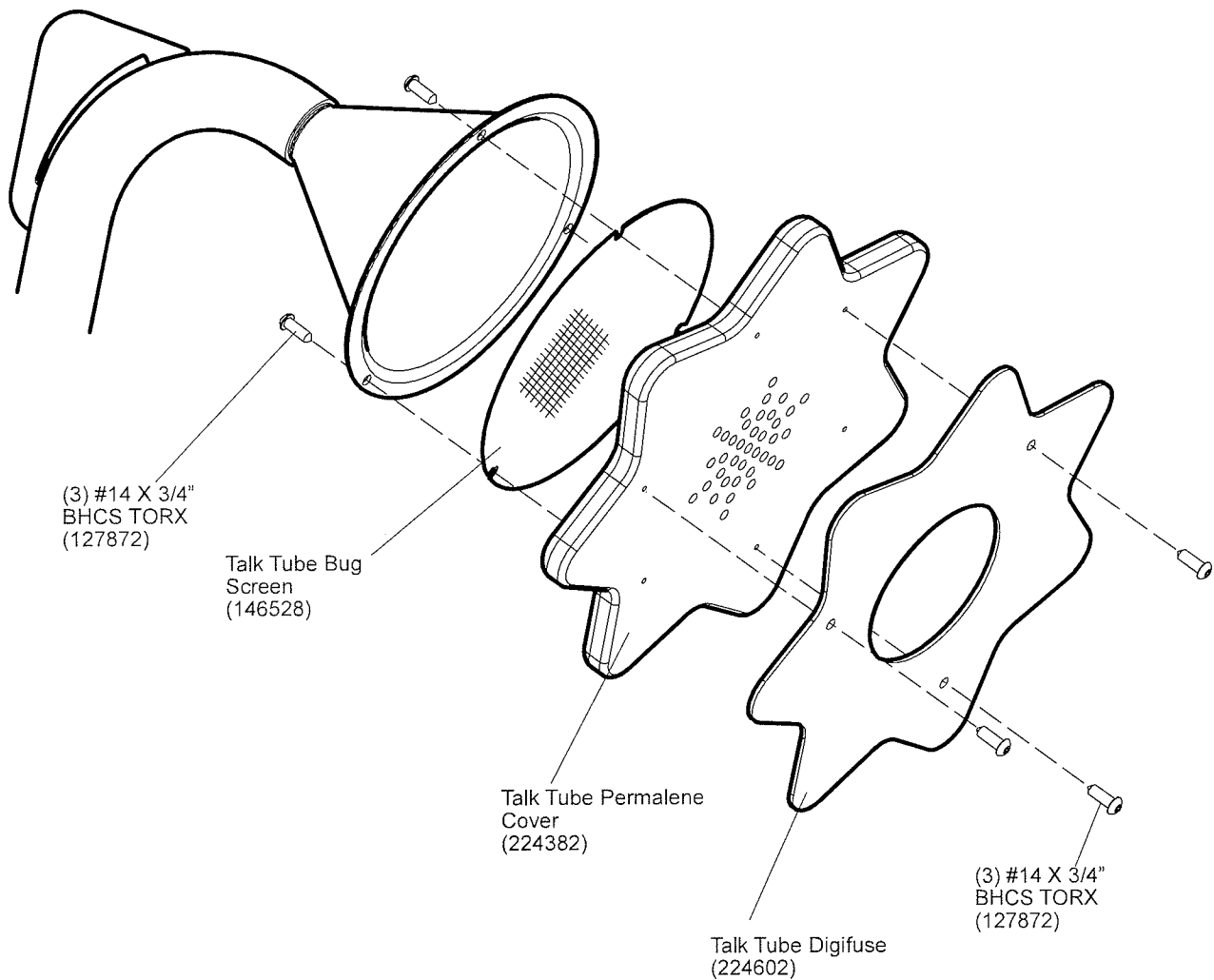
(1) Rubber Couplings
w/Hose Clamps
(173611)

Mail Box Plate
(225862)

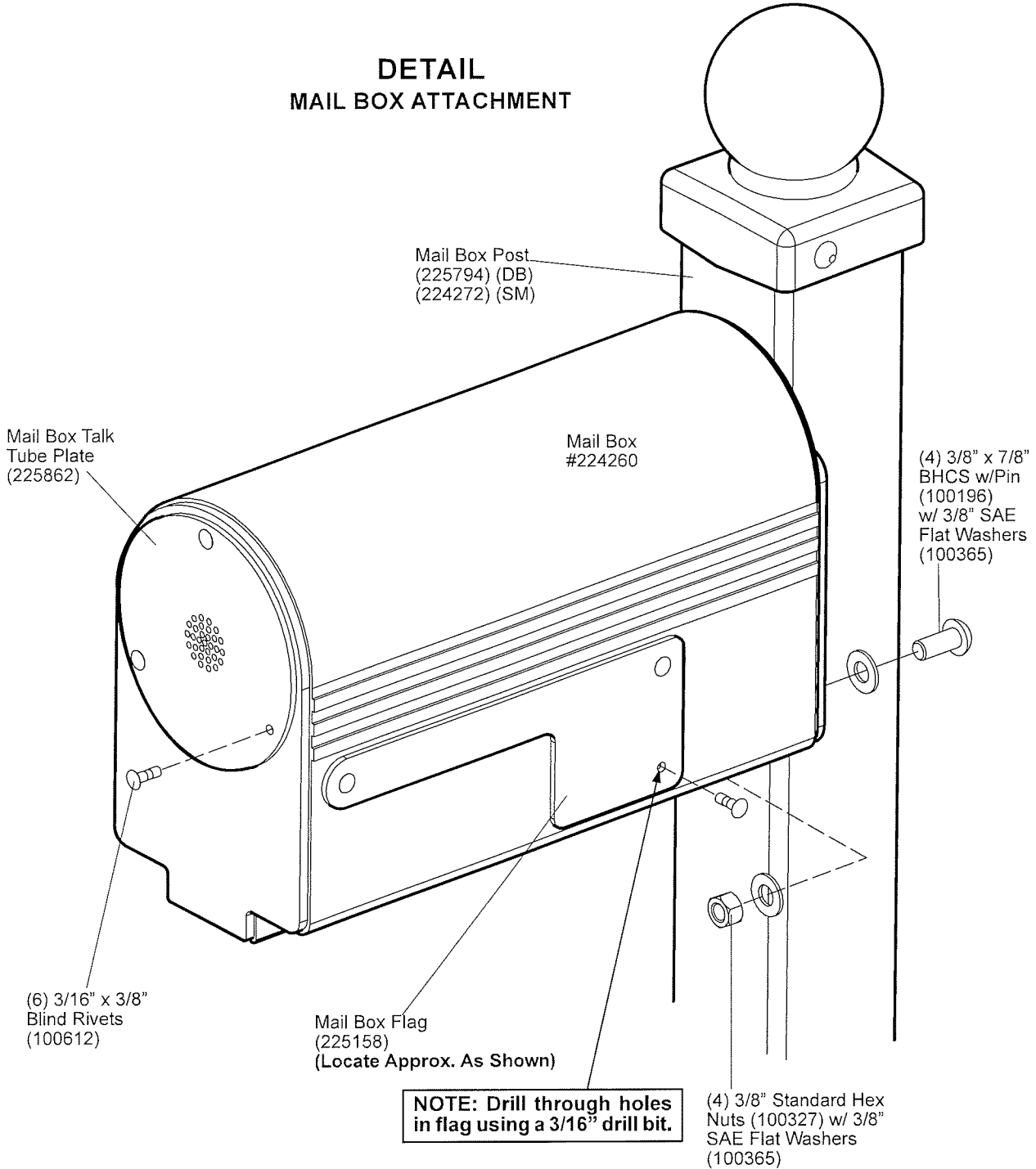
**NOTE: Trim Talk
Tube Tubing
(226212) to fit.**

**NOTE: Mail box pictorially
removed for clarity.**

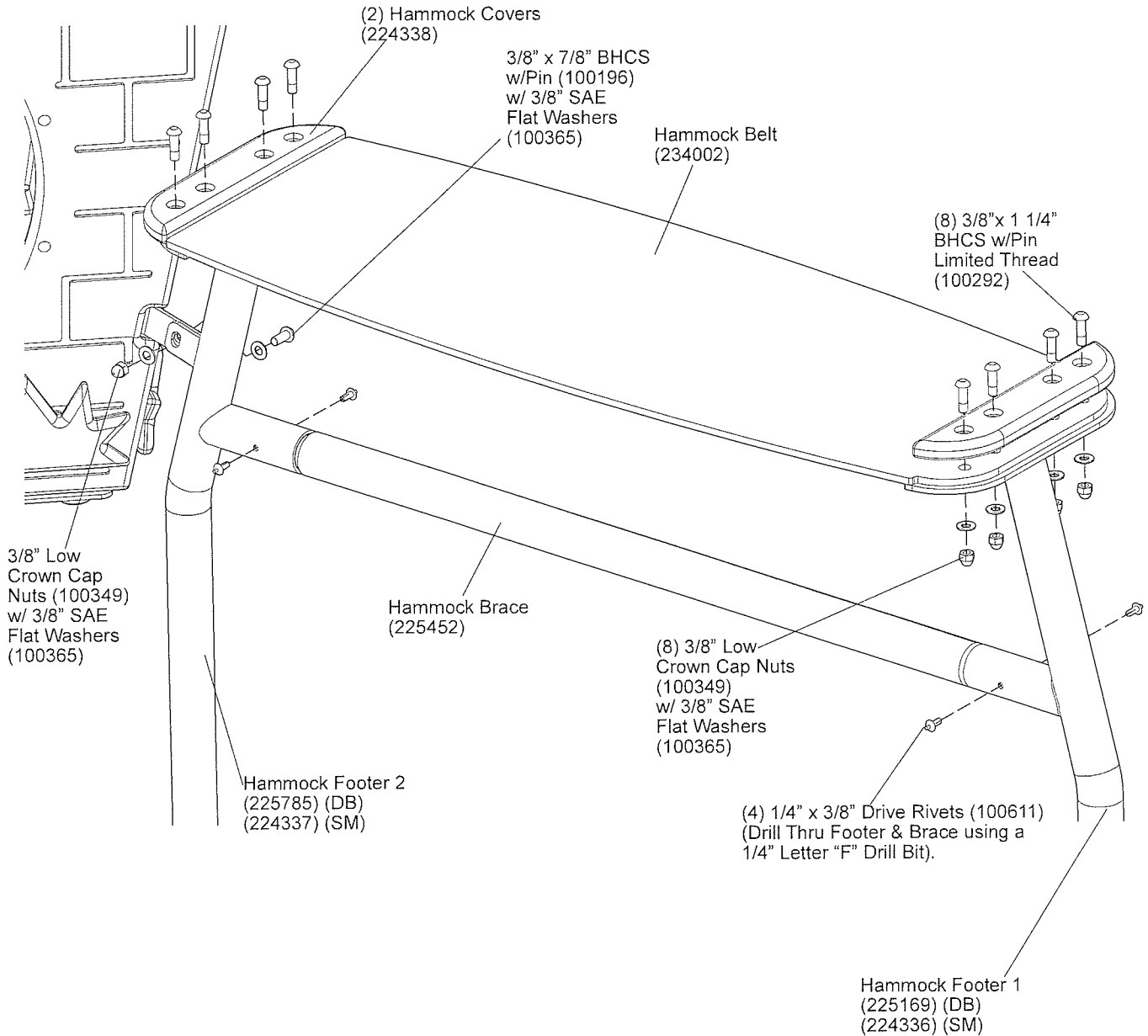
**DETAIL
TALK TUBE ASSEMBLY**



**DETAIL
MAIL BOX ATTACHMENT**

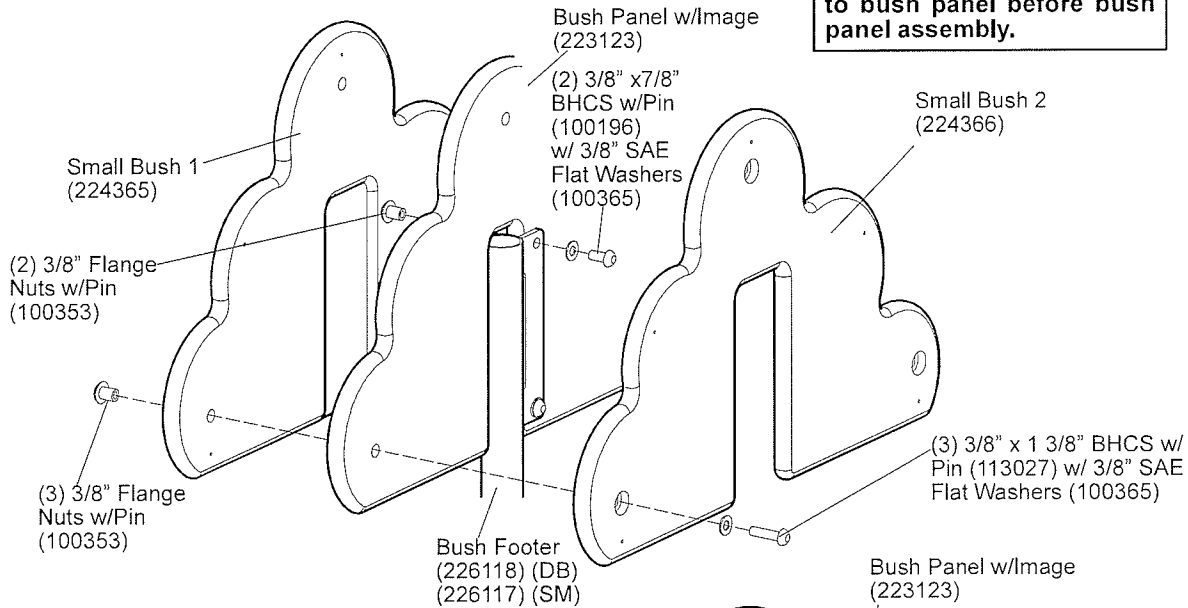


**DETAIL
 HAMMOCK ASSEMBLY**



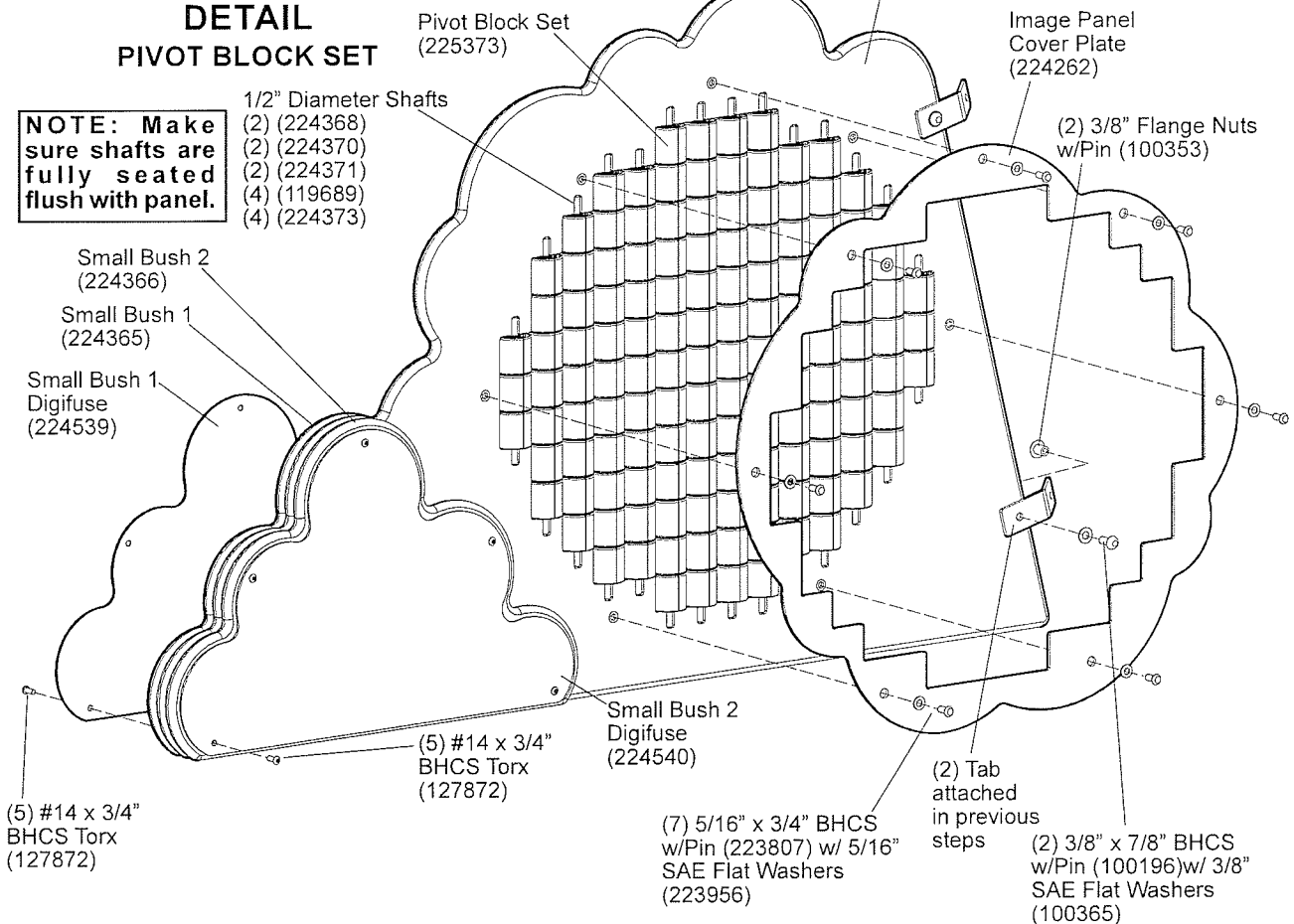
**DETAIL
SUPPORT ATTACHMENT**

NOTE: Attach bush footer to bush panel before bush panel assembly.



**DETAIL
PIVOT BLOCK SET**

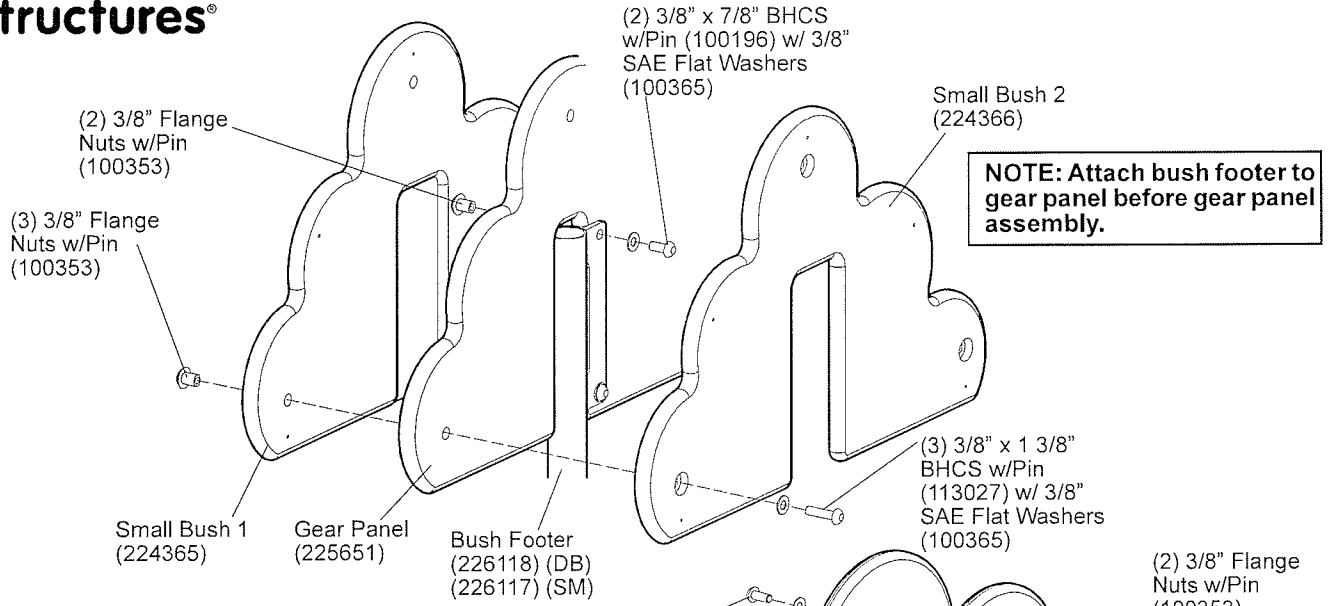
NOTE: Make sure shafts are fully seated flush with panel.



**DETAIL
SUPPORT ATTACHMENT**

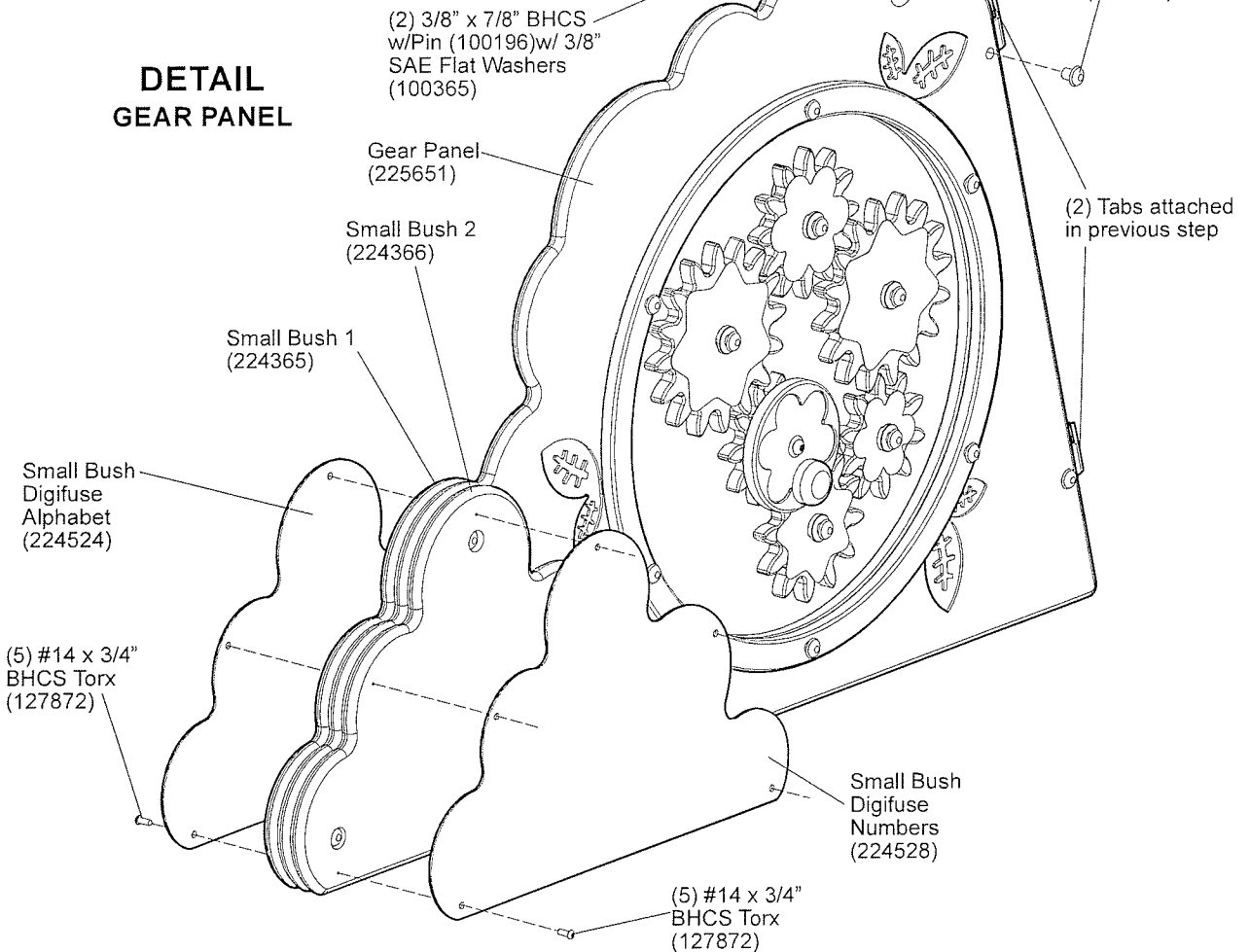


SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

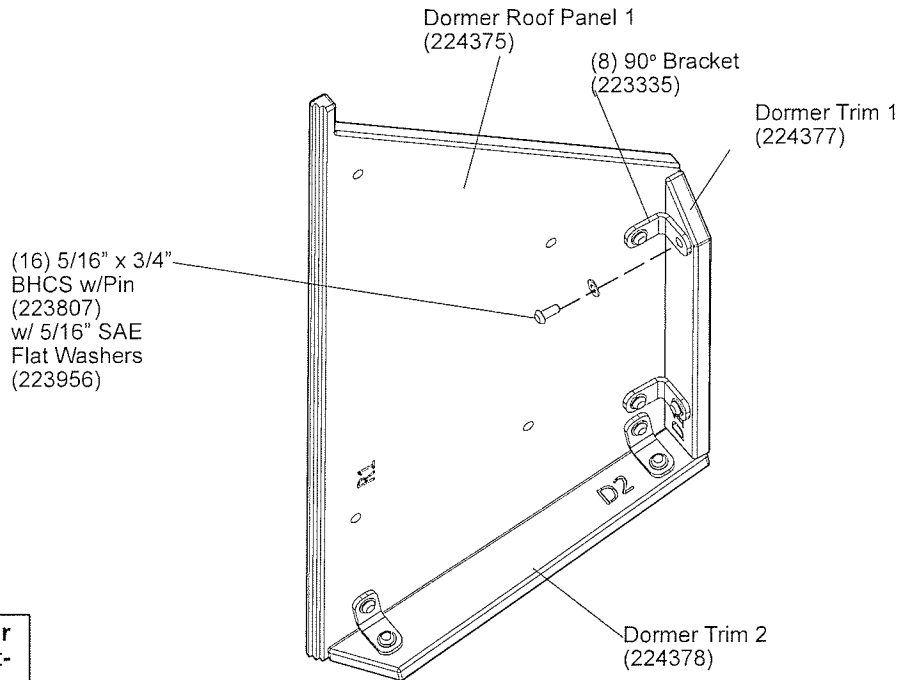
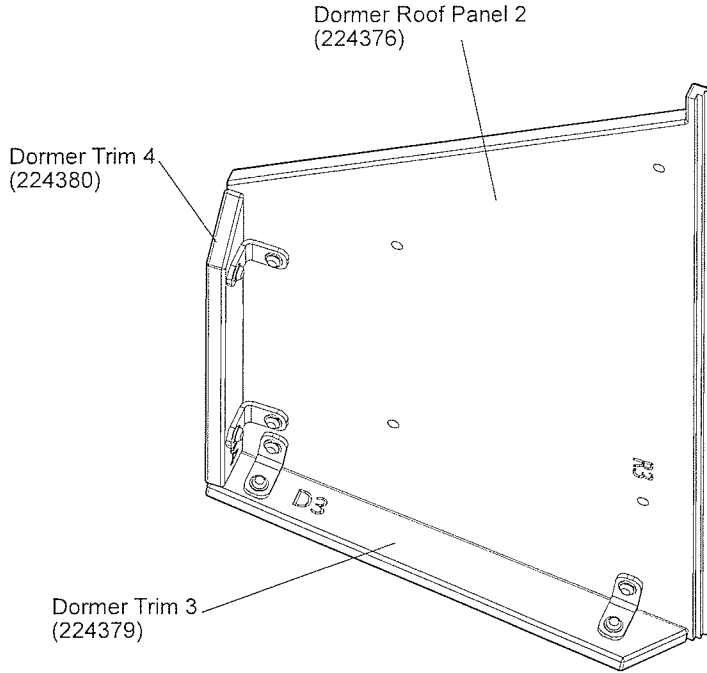


NOTE: Attach bush footer to gear panel before gear panel assembly.

**DETAIL
GEAR PANEL**

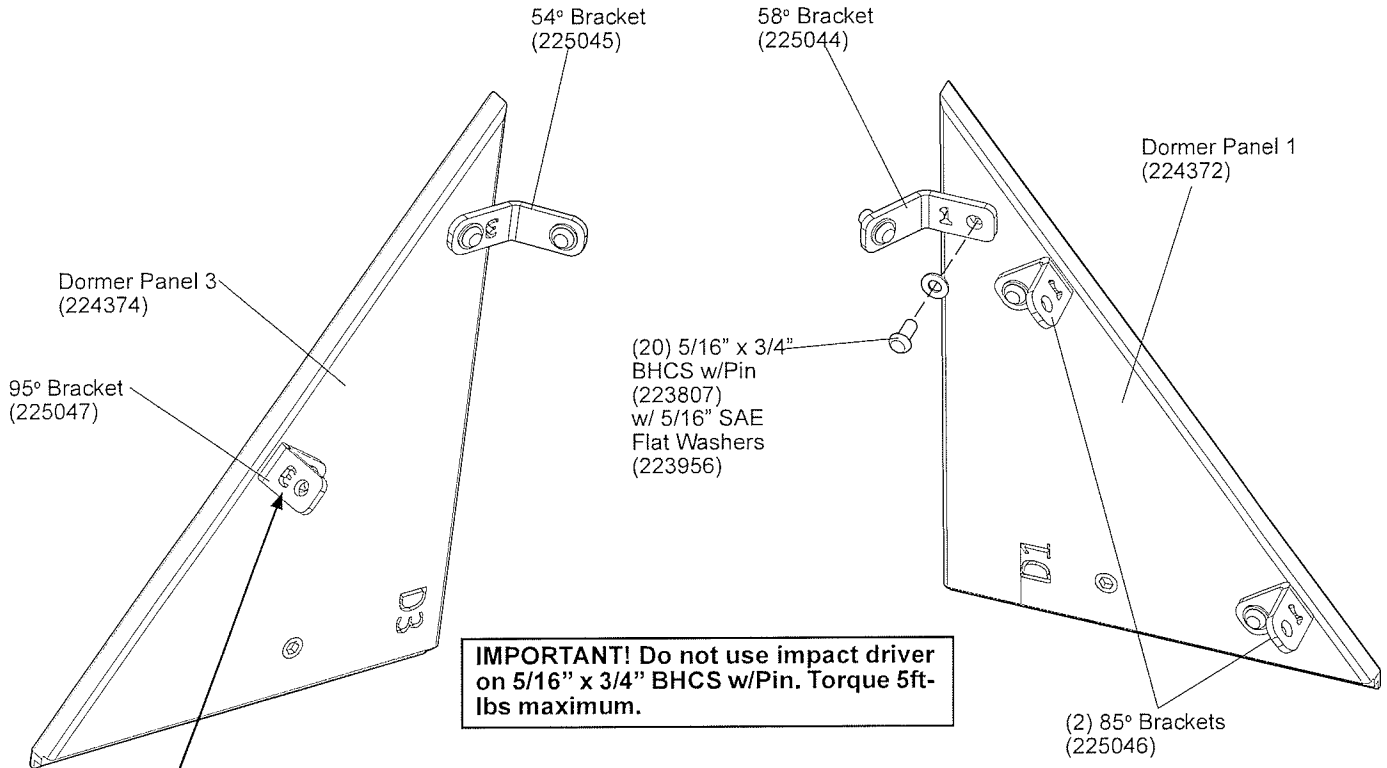


**DETAIL
DORMER ATTACHMENT**



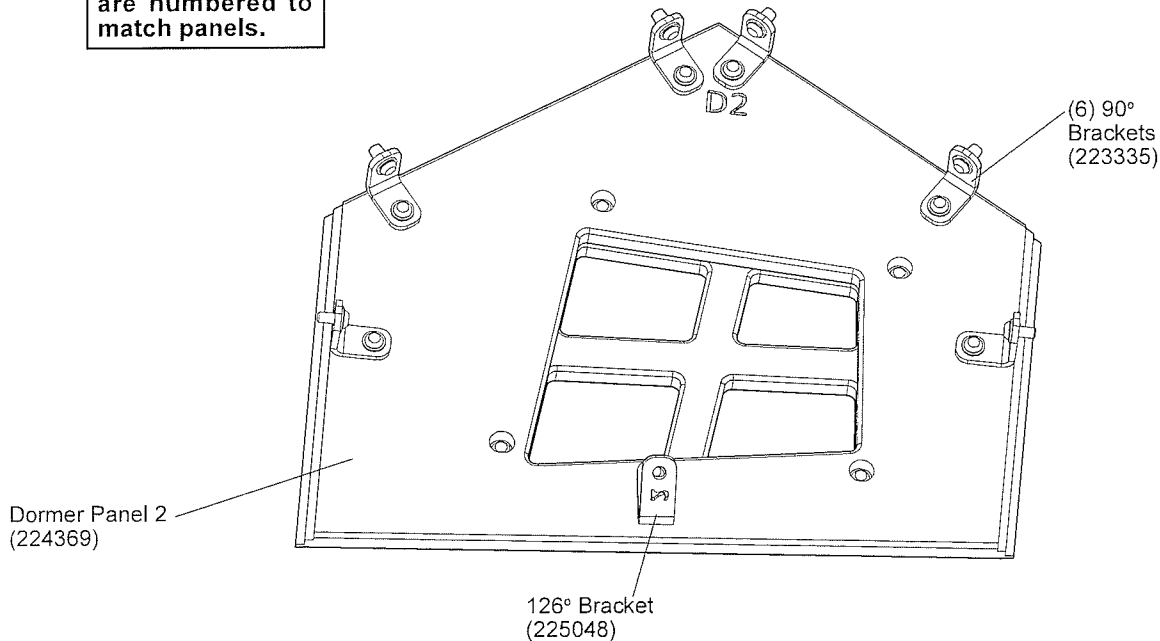
IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

DETAIL
DORMER ATTACHMENT

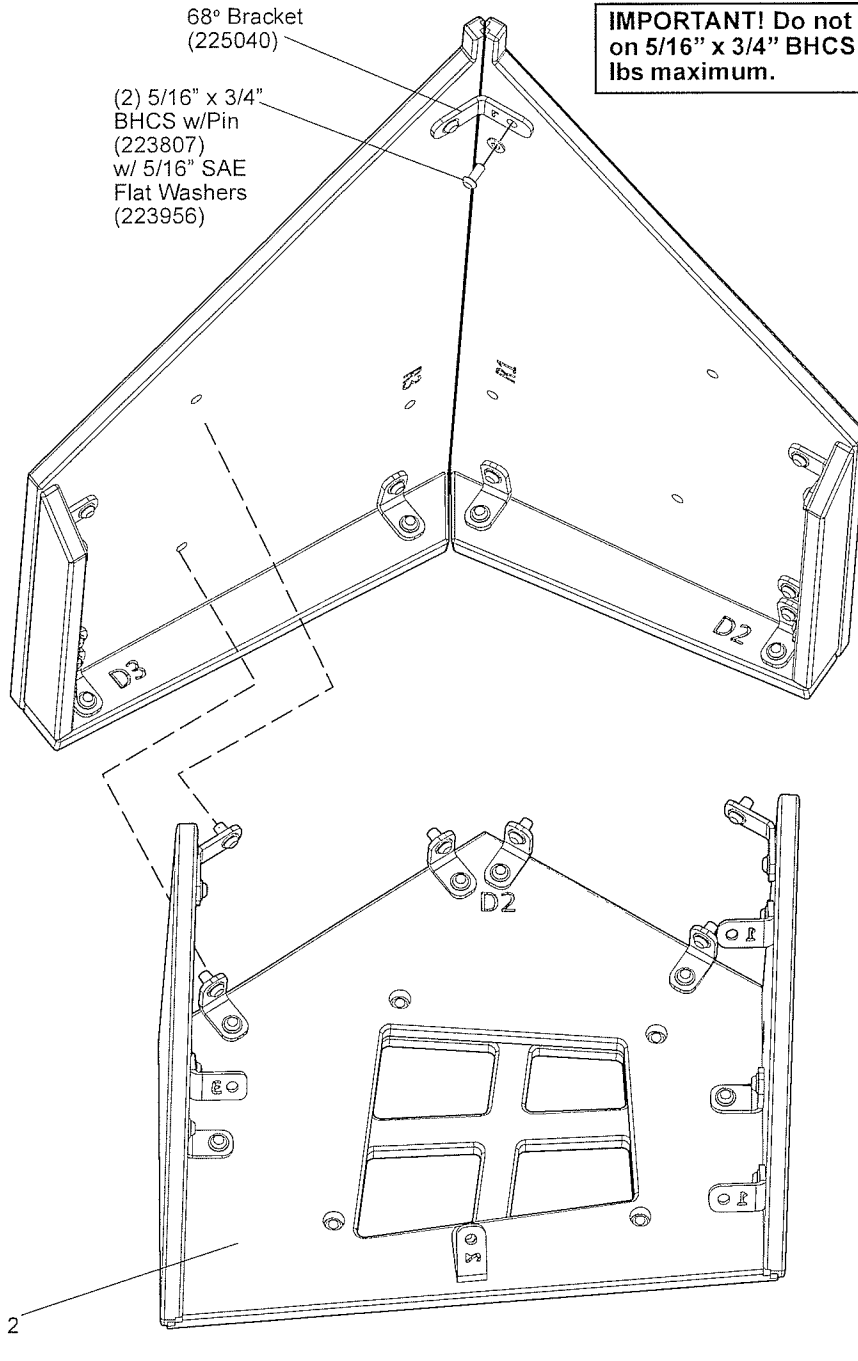


IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

NOTE: Brackets are numbered to match panels.

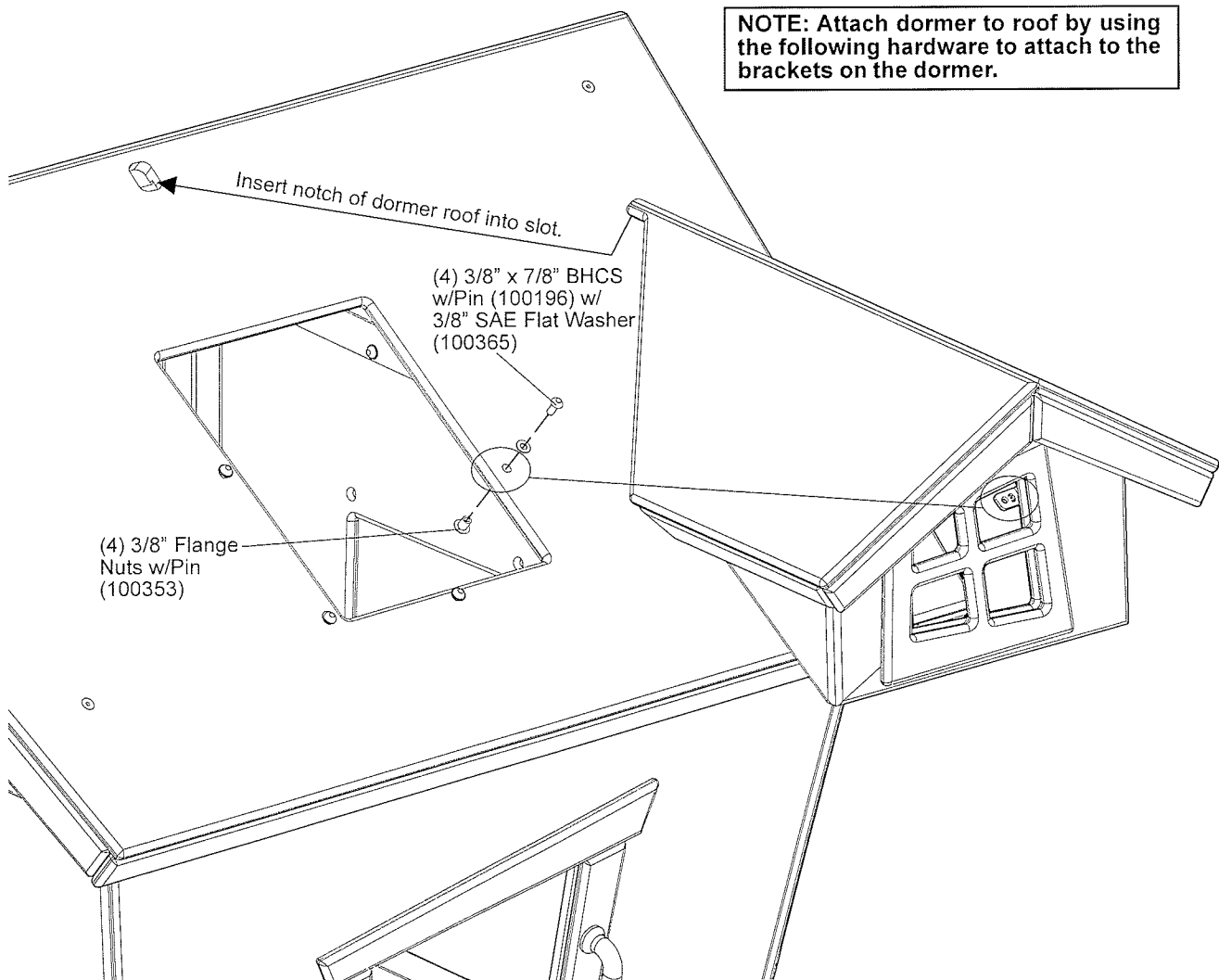


**DETAIL
DORMER ASSEMBLY
(BOTTOM VIEW)**



IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

DETAIL
DORMER TO ROOF ASSEMBLY

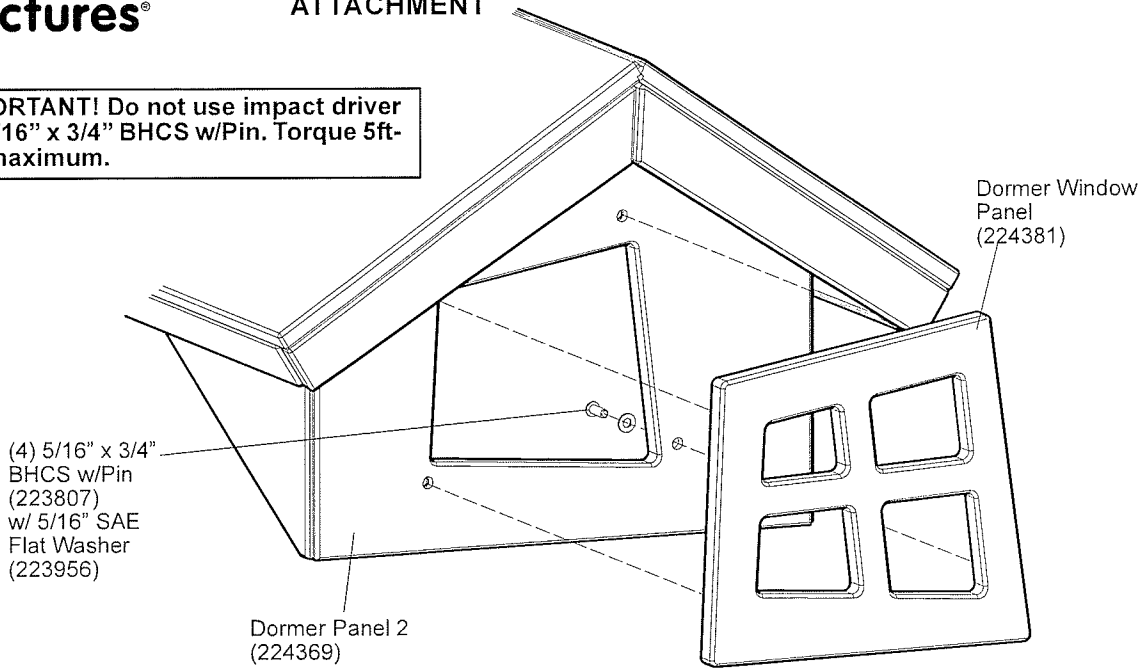


DETAIL
DORMER WINDOW PANEL
ATTACHMENT



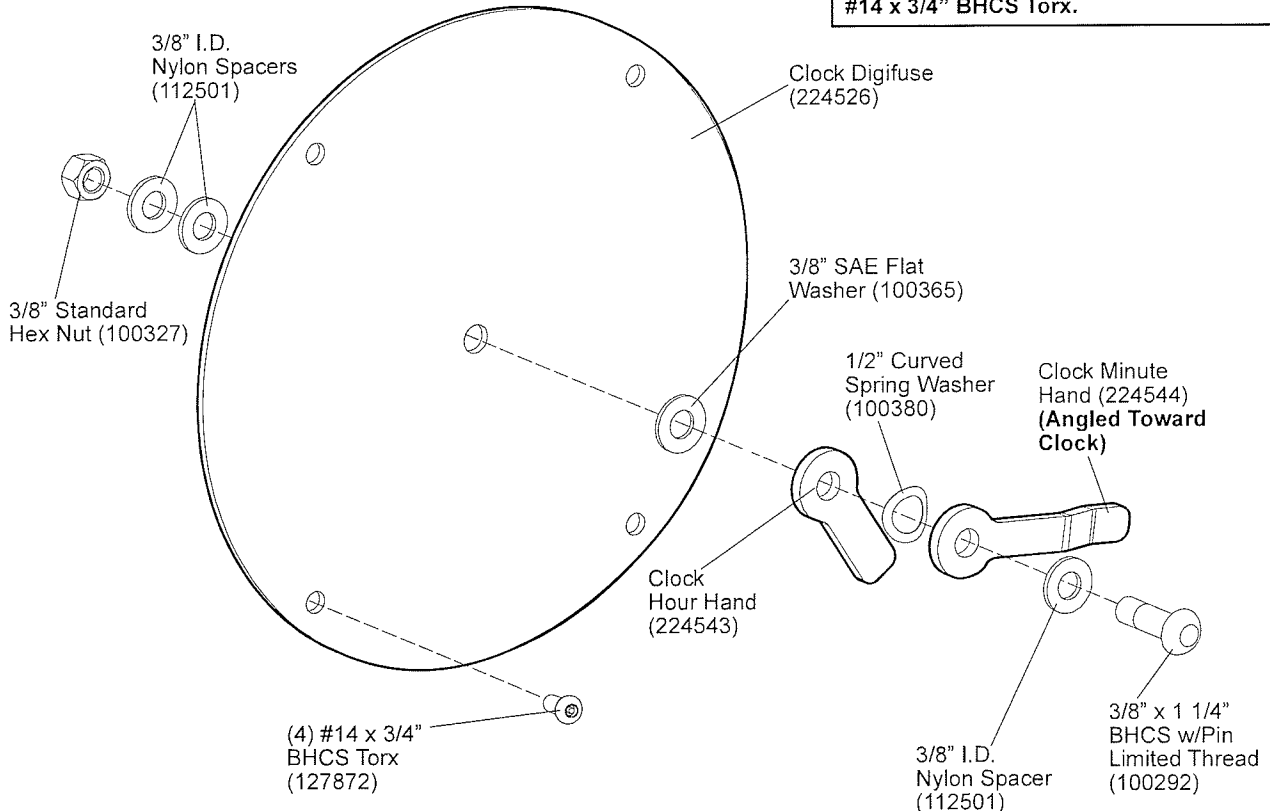
SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

IMPORTANT! Do not use impact driver on 5/16" x 3/4" BHCS w/Pin. Torque 5ft-lbs maximum.

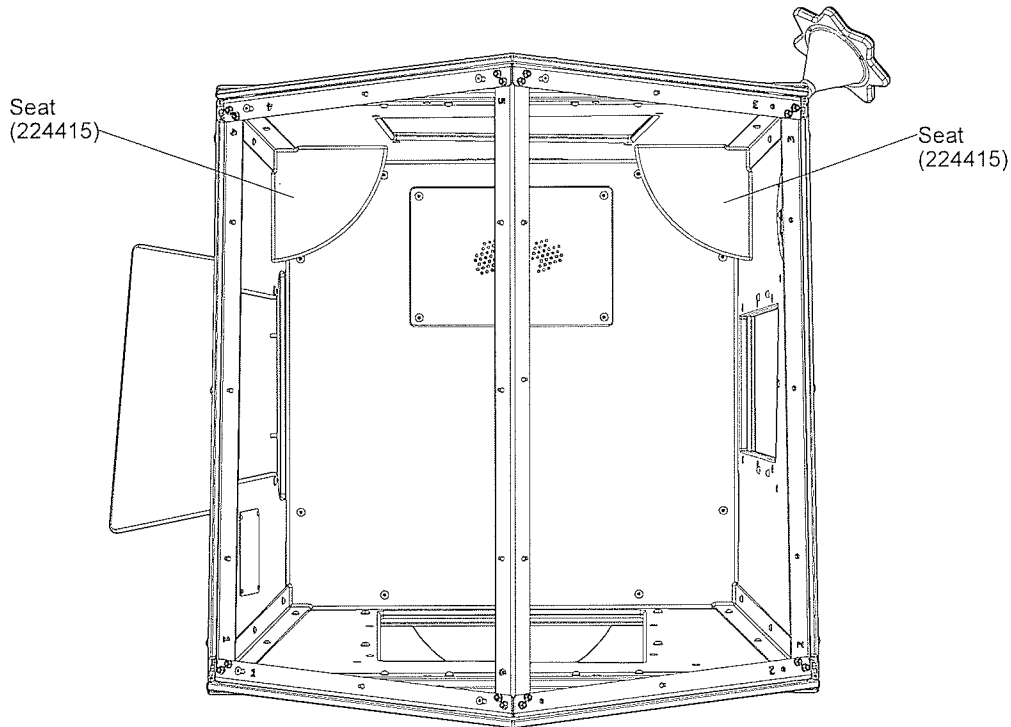


DETAIL
CLOCK ASSEMBLY

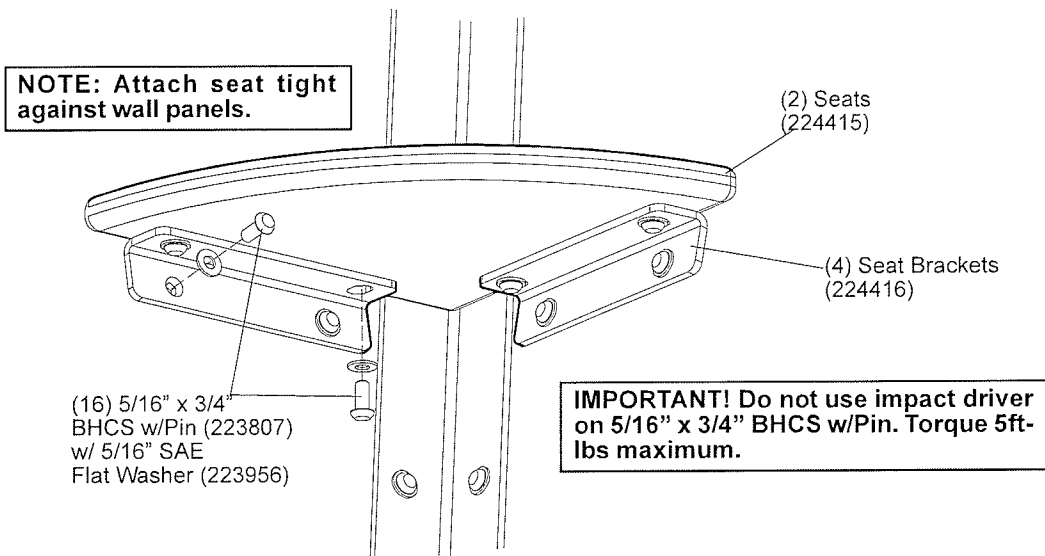
NOTE: After clock has been assembled, attach clock to upper right panel using #14 x 3/4" BHCS Torx.



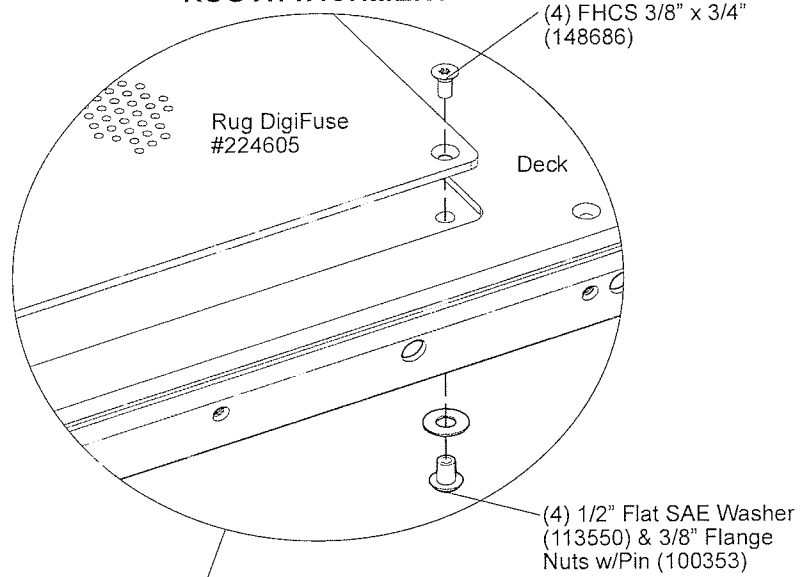
**DETAIL
SEAT LOCATION**



**DETAIL
SEAT ATTACHMENT**

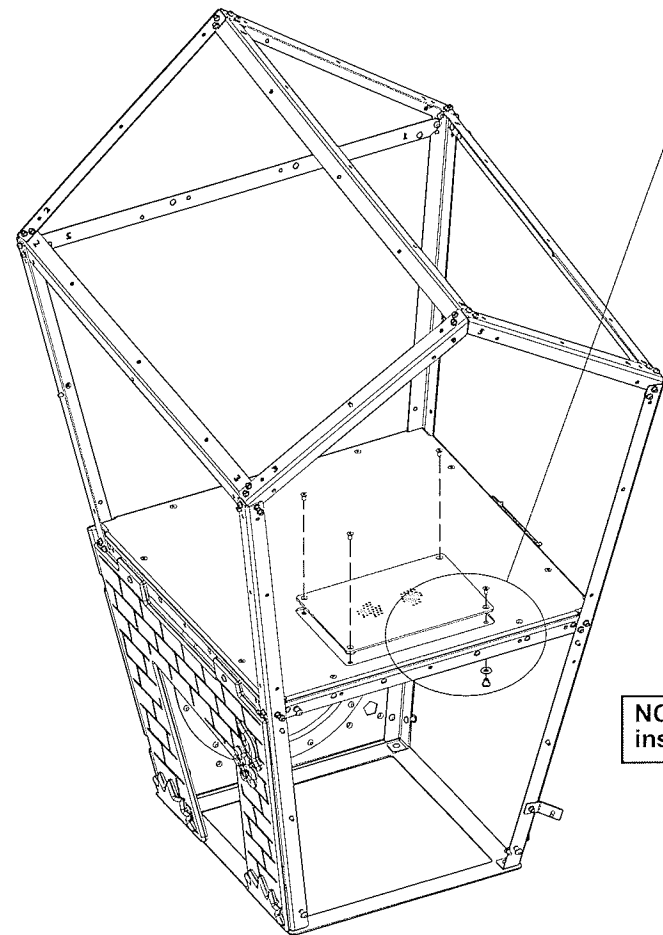


**DETAIL
RUG ATTACHMENT**

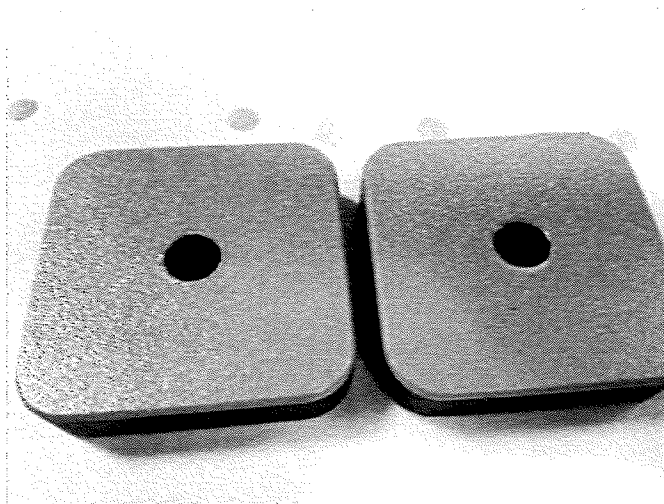
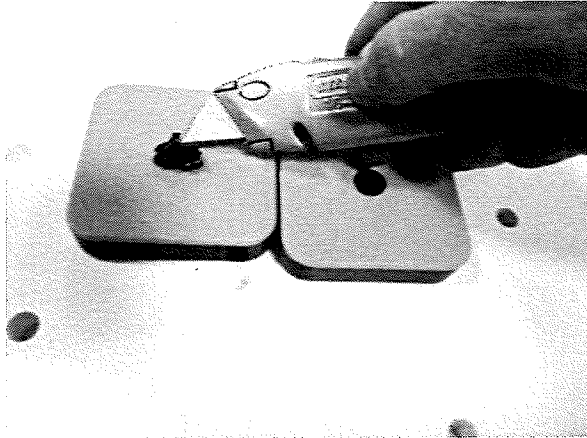


NOTE: Panels are hidden for clarity.

NOTE: Rug should be installed last.



DETAIL
INSERT REPLACEMENT



- 1) If an insert turns freely in the Permalene, then remove the insert.
- 2) Remove any burrs.
- 3) Use an adhesive for Plastics that provides a minimum tensile strength of 3,200 psi, and apply it around the insert outer threads. An example includes Plastic Weld like JB Weld.
- 4) Hand tighten the insert in the hole until snug. Do not over torque. Remove any excessive adhesive, and keep it clear of the inside threads of the insert.
- 5) Allow adhesive to fully cure before assembling.
- 6) Hand tighten the bolt into the insert to no more than 5 ft-lbs.



**landscape
structures®**
Parts List

Part#	Description	Qty.
222511	Club House 2-5 Steel Base, Specify Color.....	4
222614	2-5 Vertical Corner Front, Specify Color.....	2
222615	2-5 Vertical Corner Back, Specify Color.....	2
224292	Steel Frame 6 Roof Front Left, Specify Color.....	1
224291	Steel Frame 5 Roof Front Right, Specify Color.....	1
224293	Steel Frame 7 Roof Back Right, Specify Color.....	1
224294	Steel Frame 8 Roof Back Left, Specify Color.....	1
224295	Steel Frame 9 Roof Left Brace, Specify Color.....	1
224296	Steel Frame 10 Roof Right Brace, Specify Color.....	1
224297	Steel Frame 11 Roof Peak, Specify Color.....	1
224289	Steel Frame 3 Front Brace, Specify Color.....	1
224290	Steel Frame 4 Back Brace, Specify Color.....	1
258783	Deck, Black.....	1
224323	Lower Front Panel, Acorn.....	1
224324	Lower Right Panel, Acorn.....	1
224325	Lower Left Panel, Acorn.....	1
224326	Lower Rear Panel, Acorn.....	1
224327	Upper Front Panel, Specify Color.....	1
224328	Upper Right Panel, Specify Color.....	1
258779	Upper Left Panel, Specify Color.....	1
224330	Upper Rear Panel, Specify Color.....	1
224331	Roof Front Panel, Specify Color.....	1
224332	Roof Rear Panel, Specify Color.....	1
224333	Roof Right Panel, Gray.....	1
224334	Roof Left Panel, Gray.....	1
224348	Lower Front Trim, White.....	1
224351	Lower Right Trim, White.....	1
224352	Lower Rear Trim, White.....	1
224359	Upper Front Trim, White.....	1
224360	Upper Rear Trim, White.....	1
224418	Roof Trim 2, White.....	2
223335	90° Bracket, White.....	36
223123	Bush Panel w/Image, Leaf.....	1
223198	6-23 Upper Frame Tab, Leaf.....	5
119689	1/2" Dia. x 23.06" Shaft.....	4
224368	1/2" Dia. x 7.58" Shaft.....	2
224370	1/2" Dia. x 15.32" Shaft.....	2
224371	1/2" Dia. x 19.18" Shaft.....	2
224373	1/2" Dia. x 26.93" Shaft.....	4
225651	Gear Panel, Leaf.....	1
127162	40-48 Deck Single Poly Slide, Specify Color.....	1
224498	Slide Spacer, Specify Color.....	1
224362	Slide Hood Side, RH, Specify Color.....	1
224363	Slide Hood Side, LH, Specify Color.....	1
147807	1 1/2" x 1 1/2" x 1/8" Angle Bracket, AL., White.....	8
224384	Slide Hood Bracket, LH, Specify Color.....	1
224385	Slide Hood Bracket, RH, Specify Color.....	1
151013	Slide Footer, (SM), Specify Color.....	1
164365	Slide Footer, (DB), Specify Color.....	1
224410	Talk Tube (SM), Specify Color.....	1
222973	2-5 Stair Base B, Dark Gray.....	1
224234	Transfer Base, Dark Gray.....	1
222878	2-5 Stair Base A, Dark Gray.....	1
223051	2-5 Stair Base D, Dark Gray.....	2
223103	3" x 3" Stair Post, (SM), White.....	1
222991	Stair GripX, Black.....	1
223049	2-5 Stair Fence, White.....	2
224252	Transfer Post, (SM), White.....	1
224251	Transfer Post, RH, (SM), White.....	1
224253	Post, RH, (SM), White.....	1
224260	Mail Box, White.....	1
224272	Mail Box Post, (SM), White.....	1
224276	Step Side Plate, Dark Grey.....	2
224298	Step Handrail, Specify Color.....	2
235187	Belt Climber Belt, Black.....	1

Specifications are subject to change without notice.

223008	Belt Climber Handhold A, Specify Color.....	1
223010	Belt Climber Handhold B, Specify Color.....	1
223011	Belt Climber Handhold C, Specify Color.....	1
223012	Belt Climber Handhold D, Specify Color.....	1
223022	Belt Plate A, Specify Color.....	1
223023	Belt Bracket B, Specify Color.....	1
223034	Belt Climber Handhold A, Specify Color.....	1
223035	Belt Climber Handhold B, Specify Color.....	1
223036	Belt Climber Handhold C, Specify Color.....	1
223037	Belt Climber Handhold D, Specify Color.....	1
223087	Belt Plate B, Specify Color.....	1
105752	Handle, AL., Specify Color.....	2
224416	Seat Bracket, Specify Color.....	4
224369	Dormer Panel 2, Specify Color.....	1
224372	Dormer Panel 1, Specify Color.....	1
224374	Dormer Panel 3, Specify Color.....	1
224336	Hammock Footer 1, (SM), Specify Color.....	1
234002	Hammock Belt, Black.....	1
224338	Hammock Cover, Specify Color.....	2
224337	Hammock Footer 2, (SM), Specify Color.....	1
223121	Tunnel Bush, Leaf.....	1
139246	30° Tunnel no/Flange, Specify Color.....	1
120358	30° Tunnel w/Flange, Specify Color.....	1
133047	Tunnel Attachment Block, Specify Color.....	12
119883	Bubble.....	1
224382	Talk Tube Permalene Cover, Specify Color.....	1
224605	Rug Digifuse.....	1
224602	Talk Tube Digifuse.....	1
224539	Small Bush Digifuse 1.....	1
224540	Small Bush Digifuse 2.....	1
224524	Small Bush Digifuse Alphabet.....	1
224526	Clock Digifuse.....	1
224527	Find Panel Digifuse.....	1
224528	Small Bush Digifuse Numbers.....	1
224543	Clock Hour Hand, Specify Color.....	1
224544	Clock Minute Hand, Specify Color.....	1
223013	Belt Bracket A, Specify Color.....	1
223970	3" Square Post Cap, Specify Color.....	5
224262	Image Panel Cover Plate, Leaf.....	1
224545	Base, Specify Color.....	1
225006	Top Step, Dark Gray.....	1
225039	Deck Frame, Specify Color.....	1
225040	68° Bracket, White.....	1
225044	58° Bracket, White.....	1
225045	54° Bracket, White.....	1
225046	85° Bracket, White.....	2
225047	95° Bracket, White.....	1
225048	126° Bracket, White.....	1
225089	100° Bracket, (SM), Leaf.....	2
225123	Frame Spacer A, Specify Color.....	3
225124	Frame Spacer B, Specify Color.....	2
225125	Frame Spacer C, Specify Color.....	4
225128	Frame Spacer D, Specify Color.....	2
225158	Mail Box Flag, Red.....	1
225373	Pivot Block Set (134).....	1
225441	Talk Tube RTG, (SM), Specify Color.....	1
226212	Talk Tube Tubing (DB).....	1
225452	Hammock Brace, Specify Color.....	1
225638	Talk Tube Hose, (SM).....	2
225862	Mail Box Talk Tube Plate, Specify Color.....	1
225974	Talk Tube Tubing, (SM).....	1
226202	Belt Climber Footer, (DB), Specify Color.....	2
225756	Talk Tube, DB, Specify Color.....	1
225090	Crawl Tunnel Bracket, (DB), Leaf.....	2
185609	Bench Leg, (DB), Specify Color.....	1
225161	Loft Leg, (DB), Specify Color.....	4
225785	Hammock Footer 2, (DB), Specify Color.....	1
225169	Hammock Footer 2, (DB), Specify Color.....	1
225790	Stair Post, (LH), (DB), White.....	1
225791	Stair Post, (RH), (DB), White.....	1
225792	Transfer Post, (LH), (DB), White.....	1



Smart Play® 223857 Loft

225793	Transfer Post, (RH), (DB), White.....	1
225794	Mail Box Post, (DB), White.....	1
226117	Bush Footer, (SM), Leaf.....	2
226118	Bush Footer, (DB), Leaf.....	2
224414	Rear Window Frame, White.....	1
224436	Pepper Permalene, Tangerine.....	1
224437	Broccoli Permalene, Limon.....	1
224438	Tomato Permalene, Red.....	1
224439	Corn Permalene, Yellow.....	1
224492	Leaf, Limon.....	10
224499	Rear Window.....	1
224501	Grass Permalene Left, Leaf.....	4
224512	Grass Permalene Right, Leaf.....	4
224356	Rear Door Trim Left, White.....	1
224357	Side Door Trim 2, White.....	1
224358	Side Door Trim 3, White.....	1
234315	Hdw Pkg Loft Anchors (SM).....	1
100263	3/8" x 2 3/4" Expansion Anchor, ZP.....	44
100327	3/8" Standard Hex Nut, SST.....	44
100365	3/8" SAE Flat Washer, SST.....	44
106187	1.75 x 2.625 Angle Bracket, SST.....	2
235123	Hdw Pkg #1 Loft Frame.....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	59
100327	3/8" Standard Hex Nut, SST.....	59
100365	3/8" SAE Flat Washer, SST.....	118
235125	Hdw Pkg #2 Loft Lower Panels/Slide.....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	35
100292	3/8" x 1 1/4" BHCS w/Pin Limited Thread, SST.....	2
100327	3/8" Standard Hex Nut, SST.....	2
100349	3/8" Low Crown Cap Nut, SST.....	8
100353	3/8" Flange Nut w/Pin, SST.....	31
100362	3/8" Flat Washer, SST.....	4
100365	3/8" SAE Flat Washer, SST.....	53
111442	#871 Rubber Bushing.....	2
151421	3/8" x 1 1/2" FHCS, SST.....	8
175006	5/16" Flange Nut w/Pin, SST.....	8
223807	5/16" x 3/4" BHCS w/Pin, SST.....	32
223956	5/16" SAE Flat Washer, SST.....	32
225364	5/16" x 2 1/4" Threaded Rod, SST.....	4
307415	Hdw Pkg #3 Loft Upper Panels/Roof/Trim.....	1
100173	3/8" x 2" BHCS w/Pin, SST.....	4
100196	3/8" x 7/8" BHCS w/Pin, SST.....	39
100252	3/8" x 1 1/4" FHCS, SST.....	8
100349	3/8" Low Crown Cap Nut, SST.....	8
100353	3/8" Flange Nut w/Pin, SST.....	39
100365	3/8" SAE Flat Washer, SST.....	47
223807	5/16" x 3/4" BHCS w/Pin, SST.....	178
223956	5/16" SAE Flat Washer, SST.....	178
307416	Hdw Pkg #4 Loft Crawl Tunnel/Belt Climber.....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	46
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	20
100327	3/8" Standard Hex Nut, SST.....	16
100349	3/8" Low Crown Cap Nut, SST.....	8
100353	3/8" Flange Nut w/Pin, SST.....	42
100365	3/8" SAE Flat Washer, SST.....	38
175006	5/16" Flange Nut w/Pin, SST.....	12
216834	Roto Tunnel Contoured Washer.....	36
225364	5/16" x 2 1/4" Threaded Rod, SST.....	6
307417	Hdw Pkg #5 Loft Stairs.....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	44

100198	3/8" x 1 1/8" BHCS w/Pin, (SM), SST.....	2
100252	3/8" x 1 1/4" FHCS, SST.....	17
100327	3/8" Standard Hex Nut, SST.....	2
100349	3/8" Low Crown Cap Nut, SST.....	50
100353	3/8" Flange Nut w/Pin, SST.....	15
100365	3/8" SAE Flat Washer, SST.....	102
100611	1/4" x 3/8" Drive Rivet, AL./SST.....	10
113027	3/8" x 1 3/8" BHCS w/Pin, SST.....	8
235129	Hdw Pkg #6 Loft Bush Panels/Hammock/Slide Hood.....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	13
100292	3/8" x 1 1/4" BHCS w/Pin Limited Thread, SST.....	8
100349	3/8" Low Crown Cap Nut, SST.....	9
100353	3/8" Flange Nut w/Pin, SST.....	18
100365	3/8" SAE Flat Washer, SST.....	28
100611	1/4" x 3/8" Drive Rivet, AL./SST.....	4
113027	3/8" x 1 3/8" BHCS w/Pin, SST.....	6
127872	#14 x 3/4" BHCS Torx, SST.....	20
223807	5/16" x 3/4" BHCS w/Pin, SST.....	19
223956	5/16" SAE Flat Washer, SST.....	19
235130	Hdw Pkg #7 Loft Accessories.....	1
100292	3/8" x 1 1/4" BHCS w/Pin Limited Thread, SST.....	1
100327	3/8" Standard Hex Nut, SST.....	1
100353	3/8" Flange Nut w/Pin, SST.....	4
100365	3/8" SAE Flat Washer, SST.....	1
100380	1/2" Curved Spring Washer, SST.....	1
112501	3/8" I.D. Nylon Spacer.....	3
113550	1/2" SAE Flat Washer, SST.....	4
127872	#14 x 3/4" BHCS Torx, SST.....	8
148686	3/8" x 3/4" FHCS, SST.....	4
223807	5/16" x 3/4" BHCS w/Pin, SST.....	16
223956	5/16" SAE Flat Washer, SST.....	16
235131	Hdw Pkg #8 Loft talk Tube/Mail Box (SM).....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	4
100327	3/8" Standard Hex Nut, SST.....	4
100365	3/8" SAE Flat Washer, SST.....	8
100611	1/4" x 3/8" Drive Rivet, AL./SST.....	2
100612	3/16" x 3/8" Blind AA.....	6
127872	#14 x 3/4" BHCS Torx, SST.....	6
146528	Talk Tube Bug Screen.....	1
235132	Hdw Pkg #8 Loft Talk Tube/Mail Box (DB).....	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	4
100327	3/8" Standard Hex Nut, SST.....	4
100365	3/8" SAE Flat Washer, SST.....	8
100612	3/16" x 3/8" Blind AA.....	6
127872	#14 x 3/4" BHCS Torx, SST.....	6
146528	Talk Tube Bug Screen.....	1
173611	Rubber Coupling w/SST Hose Clamps,.....	2
293789	Hdw Pkg SmartPlay® Tool Kit.....	1
127463	Bit Hex Tpp T-27 (Torx).....	2
146007	Bit 5/16 6-Lobe T-45 Tamp.....	2
146017	Key 5/16i 6-Lobe T-45.....	2
182734	Labels 2-5 Hardware Package.....	1
115176	Hard Surface Warning Label ASTM.....	1
156845	Play Safe Label 2-5 Yrs.....	1
182212	Entanglement Warning Label.....	1
182213	Hot Surface Warning Label.....	1
238569	Loft Boxed Set.....	1
222994	Stair GripX Small, Black.....	1
224249	Tread 3 & 4, Black.....	2
224349	Lower Left Trim 1, White.....	1
224350	Lower Left Trim 2, White.....	1

Specifications are subject to change without notice.

224353	Front Door Trim Left, White.....	1
224354	Front Door Trim Top, White.....	1
224355	Front Door Trim Right, White.....	1
224361	Slide Hood Roof, Gray.....	1
224365	Small Bush 1, Leaf.....	2
224366	Small Bush 2, Leaf.....	2
224375	Dormer Roof Panel 1, Gray.....	1
224376	Dormer Roof Panel 2, Gray.....	1
224377	Dormer Trim 1, White.....	1
224378	Dormer Trim 2, White.....	1
224379	Dormer Trim 3, White.....	1
224380	Dormer Trim 4, White.....	1
224381	Dormer Window Panel, White.....	1
224411	Front Peak Window Frame, White.....	1
224412	Rear Peak Window Frame, White.....	1
224413	Roof Window Frame, White.....	1
224415	Seat, Acorn.....	2
224417	Roof Trim 1, White.....	1
224419	Roof Trim 3, White.....	1
224420	Roof Trim 4, White.....	1
224421	Roof Trim 6, White.....	1
224079	Flower Spinner, Red.....	1
224079	Flower Spinner, Tangerine.....	1
224500	Roof Window.....	1
224259	Circle Travel Panel, Limon.....	4

SM = Surface Mount
DB = Direct Bury

Specifications

Frame: 7GA. (.179") (4,54 mm) thick HRPO steel. Finish: ProShield®, color specified.

Window: 3/16" (4,74 mm) Thick clear polycarbonate.

Fence Post: 7GA. (.179") (4,54 mm) thick HRPO steel. Finish: ProShield®, white in color.

Stair Base: 7GA. (.179") (4,54 mm) thick HRPO steel. Finish: ProShield®, dark gray in color.

GripX Panels: .750" (19,05 mm) Thick Permalene, black in color.

Panels: Recycled Permalene®, color specified.

Handle: Cast aluminum. Finish: ProShield®, color specified.

Trim: Recycled Permalene, white in color.

Fence: Recycled Permalene, white in color.

Fence Rail: Weldment comprised of 7GA. (.179") (4,54 mm) thick HRPO steel sheet and 1.029" (26,13 mm) O.D. RS20 (.070"- .080") (1,77 mm-2,03 mm) galvanized steel tubing. Finish: ProShield®, color specified.

Slide Hood Side: Recycled Permalene®, color specified.

Slide: Rotationally molded from U.V. stabilized linear low density polyethylene, color specified.

Slide Footer: Weldment comprised of 2.375" (60,32 mm) O.D. RS20 (.095"- .105") (2,41 mm-2,66 mm) galvanized steel tubing and 1/4" (6,35 mm) steel plate. Finish: ProShield®, color specified.

Loft Leg: Weldment comprised of 1.660" (42,16 mm) O.D.

Specifications are subject to change without notice.

RS40 (.108"- .132") (2,15 mm-2,41 mm) galvanized steel tubing, and 3/8" (9,52 mm) stainless steel weld slug. Finish: ProShield®, color specified.

Talk Tube: Weldment comprised of 1.600" (40,64 mm) O.D. RS20 (.085"- .095") (2,15 mm-2,41 mm) galvanized steel tubing, 14 GA. (.079") (2,00 mm) cold rolled steel sheet zinc plate, and 3/16" (4,74 mm) HRPO steel sheet. Finish: ProShield®, color specified.

Talk Tube Cover: Recycled Permalene®, color specified.

Bug Screen: Weave .011 (0,27 mm) Ga. charcoal fiberglass screen.

Belt: Made from .315 (8,00 mm) mini rough top 3-ply rubber belting, black in color.

Tunnel: Rotationally molded from U.V. stabilized linear low density polyethylene, color specified.

Bubble: Vacuum formed .230" (5,84 mm) x 26 3/8" (669 mm) diameter clear polycarbonate.

DigiFuse Panel: Made from 1/8" (3,17 mm) thick aluminum sheet. Dye sublimation printed digital artwork is fused onto the powder coated substrate.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: DB Approx. 32 labor hours
SM Approx. 26 labor hours

Concrete: DB Approx. 24.89 cu. ft.

Fall Height: 44" (1066 mm)

Weight: DB 1925 lbs.

SM 1888 lbs.

Area Req: 25'-11 1/4" x 27' 1 1/4" (7,90 m x 8,26 m)

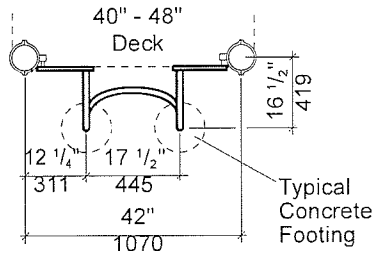
Overall Height: 96" (2438mm)

Installation Instructions

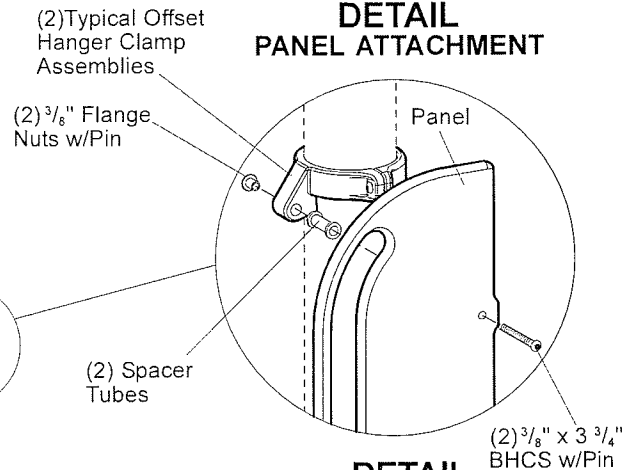
- 1) **(Direct Bury)** Dig footings spaced as shown.
- 2) Assemble structure following Steps & Details shown.
- 3) **(Direct Bury)** With structure square, plumb and level, pour concrete footings. Allow concrete to cure a minimum of 72 hours before users are allowed to play on the structure.
Surface Mount - Drill 3/8" x 3" deep holes through post and footer plates into concrete slab using 3/8" masonry bit and hammer drill. Tap 3/8" x 2 3/4" expansion anchors into drilled holes and fasten with 3/8" standard hex nuts and 3/8" SAE flat washers.
- 4) Attach warning labels to structure.
- 5) Install protective surfacing before users are allowed to play on the structure.

Sheet 52 of 52

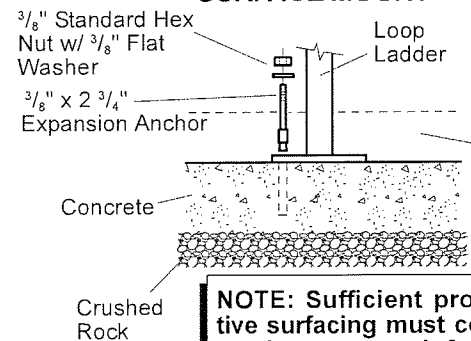
PLAN VIEW/ FOOTING LAYOUT



DETAIL PANEL ATTACHMENT

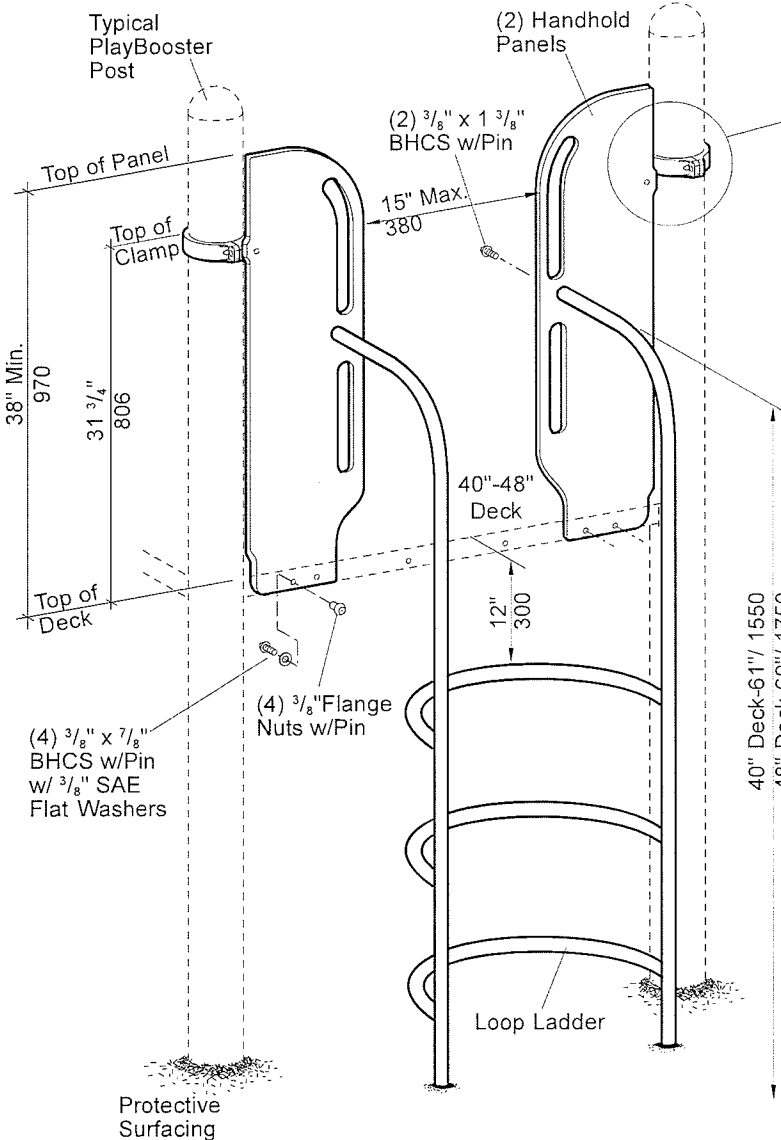
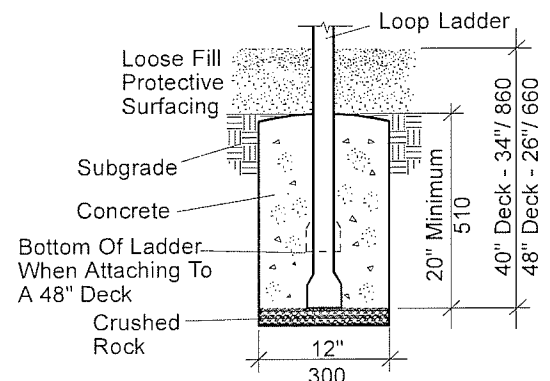


DETAIL SURFACE MOUNT



NOTE: Sufficient protective surfacing must cover hardware to satisfy fall height requirements.

DETAIL DIRECT BURY



PlayBooster®

128252 Loop Ladder, 40"-48"

601 7TH STREET SOUTH, DELANO, MINNESOTA 55328-8605 888-574-4678 LSI Install Help 888-438-6574 LSI Direct 763-972-5200 Int. FAX (763) 972-3185

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Document #13989000



PlayBooster® 128252 Loop Ladder, 40"-48"

Parts List

Part#	Description	Qty.
113558	Loop Ladder (40" & 48") DB, Specify Color	1
112913	Loop Ladder 40" SM, Specify Color	1
113567	Loop Ladder 48" SM, Specify Color	1
139563	Handhold Panel, Specify Color	2
105327	5" Half Clamp, Specify Color	2
113729	Offset Hanger Clamp, Specify Color	2
113468	Spacer Tube, Specify Color	2
100610	1/4" x 5/8" Drive Rivet AL/SST	2
139892	Loop Ladder (Tenderdeck) Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	4
100351	3/8" Tee Nut, SST	4
100353	3/8" Flange Nut w/Pin, SST	6
100365	3/8" SAE Flat Washer, SST	4
113027	3/8" x 1 3/8" BHCS w/Pin, SST	2
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2
121256	2-Hole (SM) Hardware Package	1
100263	3/8" x 2 3/4" Expansion Anchor	2
100327	3/8" Standard Hex Nut, SST	2
100365	3/8" SAE Flat Washer, SST	2

DB = Direct Bury
SM = Surface Mount

Specifications

Loop Ladder: Weldment comprised of 1.125" O.D. 11 GA (.120") black steel tubing. Finish: TenderTuff®, color specified.

Handhold Panel: Solid color Permalene® with 3/4" x 1 1/8" handholds, color specified.

Spacer Tube: Made from 6061-T6 aluminum 7/8" O.D. x 1 1/16". Finish: ProShield®, color specified.

Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: SM - Approx. 1 1/2 man hours
DB - Approx. 2 man hours

Concrete Req.: 26" - Approx. 2.6 cu. ft.

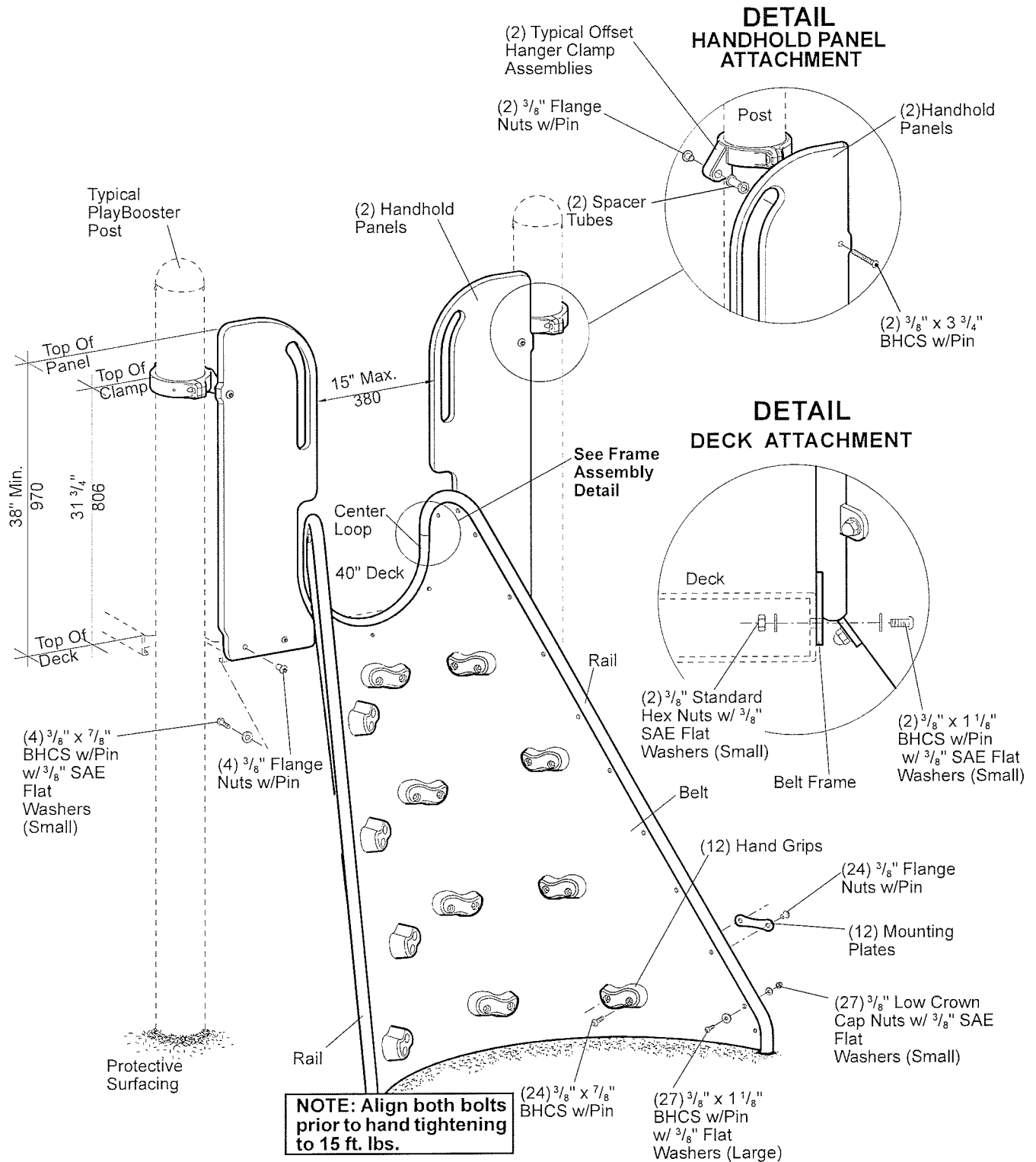
Weight: 64 lbs.

Fall Height: Deck Height

Installation Instructions

- 1) **(Direct Bury)** Dig footing holes spaced as shown.
- 2) Attach the handhold panels to the face of the deck using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" flange nuts w/pin.
- 3) Attach offset hanger clamps to posts at height shown using 5" half clamps, 3/8" x 1 1/8" BHCS w/pin and 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 4) Attach handhold panels to the offset hanger clamp assemblies using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. Refer to the Panel Attachment Detail.
- 5) Using a 7/16" drill bit, drill out the upper 1/8" pilot hole in each handhold panel for attachment of loop ladder.
- 6) Attach loop ladder to handhold panels using 3/8" x 1 3/8" BHCS w/pin.
- 7) **(Direct Bury)** With loop ladder plumb, pour concrete footings. Allow concrete footings to cure for a minimum of 72 hours before users are allowed to play on the structure.

(Surface Mount) With loop ladder plumb, drill 3/8" x 3" deep holes through mounting plates using hammer drill and 3/8" masonry bit. Tap expansion anchors into drilled holes. Fasten mounting plates to expansion anchors using 3/8" standard hex nuts with 3/8" SAE flat washers.
- 8) Install protective surfacing before users are allowed to play on the structure.





PlayBooster® 143199 Conical Climber™, 40"

Parts List

Part#	Description	Qty.
236063	Belt	1
160052	Rail, Specify Color	2
151244	Center Loop, Specify Color	1
143087	Footer, (DB), Specify Color	2
143166	Footer, (SM), Specify Color	2
143604	Handhold Panel, Specify Color	2
142878	Mounting Plate, Black	12
113468	Spacer Tube, Specify Color	2
105327	5" Half Clamp, Specify Color	2
113729	Offset Hanger Clamp, Specify Color	2
100610	1/4" x 3/8" Drive Rivet, AL/SST	2
143492	Hand Grip Set	1
143110	Hand Grip, Blue	3
143110	Hand Grip, Yellow	3
143110	Hand Grip, Red	3
143110	Hand Grip, Green	3
151356	Conical Climber, Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST	28
100198	3/8" x 1 1/8" BHCS w/Pin, SST	35
100327	3/8" Standard Hex Nut, SST	2
100349	3/8" Low Crown Cap Nut, SST	27
100351	3/8" Tee Nut, SST	4
100353	3/8" Flange Nut w/Pin, SST	32
100362	3/8" Flat Washer (Large), SST	27
100365	3/8" SAE Flat Washer (Small), SST	35
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2
100609	1/4" x 3/16" Drive Rivet, AL/AL	2
121348	4-Hole (SM) Hardware Package	1
100266	1/2" x 2 3/4" Expansion Anchor	4
100322	1/2" Standard Hex Nut, SST	4
100363	1/2" Flat Washer, SST	4

DB = Direct Bury
SM = Surface Mount

Specifications

Center Loop:	Weldment comprised of 1.315" O.D. RS-20 (.080" - .090") galvanized steel tubing, 1/4" x 1 1/4" HR flat steel and 1/4" x 2 3/4" HR flat steel. Finish: ProShield®, color specified.
Rails:	Weldment comprised of 1.315" O.D. RS-20 (.080" - .090") galvanized steel tubing, and 1/4" x 1 1/4" HR flat steel. Finish: ProShield, color specified.
Footer:	Fabricated from 1.125" O.D. 11 GA. (.120") galvanized steel tubing. Finish: ProShield, color specified.
Mounting Plate:	Fabricated from 1/8" HR flat steel. Finish: ProShield, black.
Hand Grip:	Made from Polyester Resin. Hand Grips measure approx. 5 3/4" long x 2 1/4" wide x 1 3/4" high.
Handhold Panel:	Solid color Permalene®, color specified.
Belt:	.315" (8, 00 mm) Thick mini rough top rubber belting with polyester fabric ply, black in color.
Spacer Tube:	Made from 6061-T6 aluminum 7/8" O.D. x 1 11/16". Finish: ProShield, color specified.
Offset Hanger Clamp Assembly:	Cast aluminum. Finish: ProShield, color specified.

Specifications are subject to change without notice.

- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** SM - Approx. 2 1/2 hours
DB - Approx. 3 1/2 hours
- Concrete Req.:** Approx. 2.6 cu. ft.
- Weight:** SM - 120 lbs.
DB - 124 lbs.
- Fall Height:** Deck Height

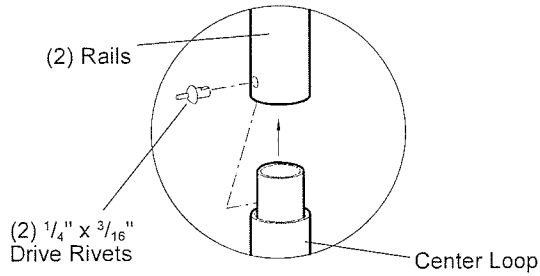
Installation Instructions

- (Direct Bury)** Dig footing holes spaced as shown.
 - Insert upper loop onto rails.
 - Drill through holes in rails into center loop with a 1/4" or "F" (only) drill bit. Insert 1/4" x 3/16" drive rivets in holes and hammer drive rivet pin in until flush with head. Refer to the Frame Assembly Detail & Plan View/Footing Layout.
 - Attach belt to framework using 3/8" x 1 1/8" BHCS w/pin with 3/8" flat washers (large) and 3/8" low crown cap nuts with 3/8" SAE flat washers (small). Begin at the center of the upper loop on the frame assembly, continuing down both side rails. **NOTE: Use a center punch to stretch the belt into position on bolt flange. Refer to the Belt Attachment Detail.**
 - Attach footers to belt frame using 3/8" x 1 1/8" BHCS w/pin and 3/8" flange nuts w/pin.
 - Attach belt frame to deck using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers (small) and 3/8" standard hex nuts with 3/8" SAE flat washers (small). Refer to the Deck Attachment Detail.
 - Attach hand grips to belt using 3/8" x 7/8" BHCS w/pin and mounting plates with 3/8" flange nuts w/pin.
 - Attach offset hanger clamps to posts at heights shown using 5" half clamps, 3/8" x 1 1/8" BHCS w/pin and 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
 - Attach handhold panels to deck using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers (small) and 3/8" flange nuts w/pin.
 - Attach handhold panels to the offset hanger clamp assemblies using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. Refer to the Handhold Panel Attachment Detail.
 - Install 1/4" x 3/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
 - (Direct Bury)** With belt climber in final position, pour concrete footings. Allow concrete footings to cure for a minimum of 72 hours before users are allowed to play on the structure.
- (Surface Mount)** Drill 1/2" x 3" deep holes through footer plates using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Fasten footer plates to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
- Install protective surfacing before users are allowed to play on the structure.

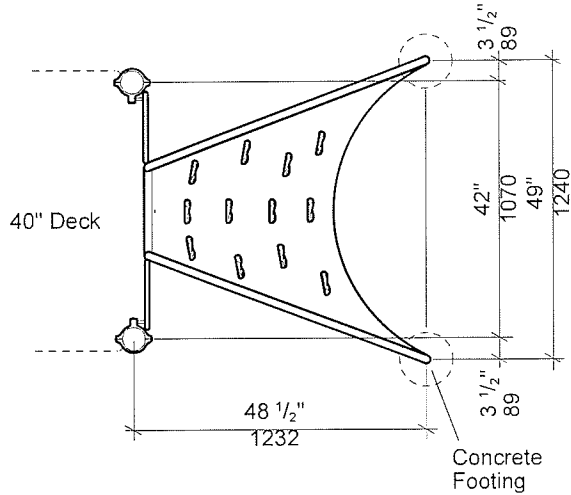
SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

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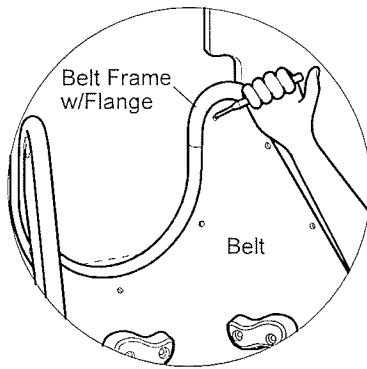
**DETAIL
 FRAME ASSEMBLY**



PLAN VIEW/FOOTING LAYOUT

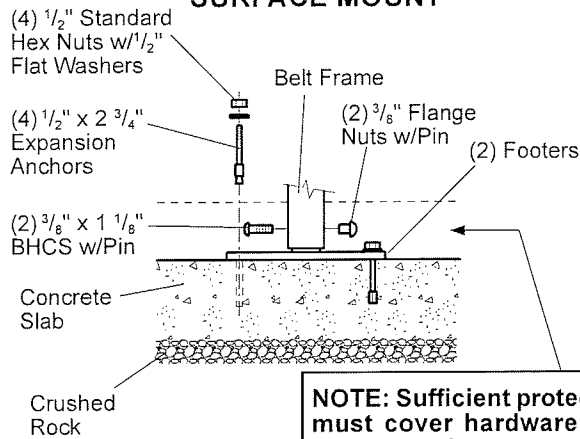


**DETAIL
 BELT ATTACHMENT**



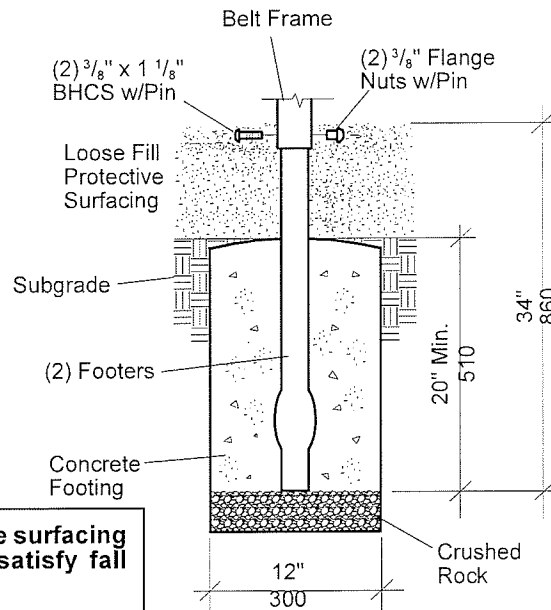
NOTE: Use a center punch to stretch the belt into position on bolt flange.

**DETAIL
 SURFACE MOUNT**

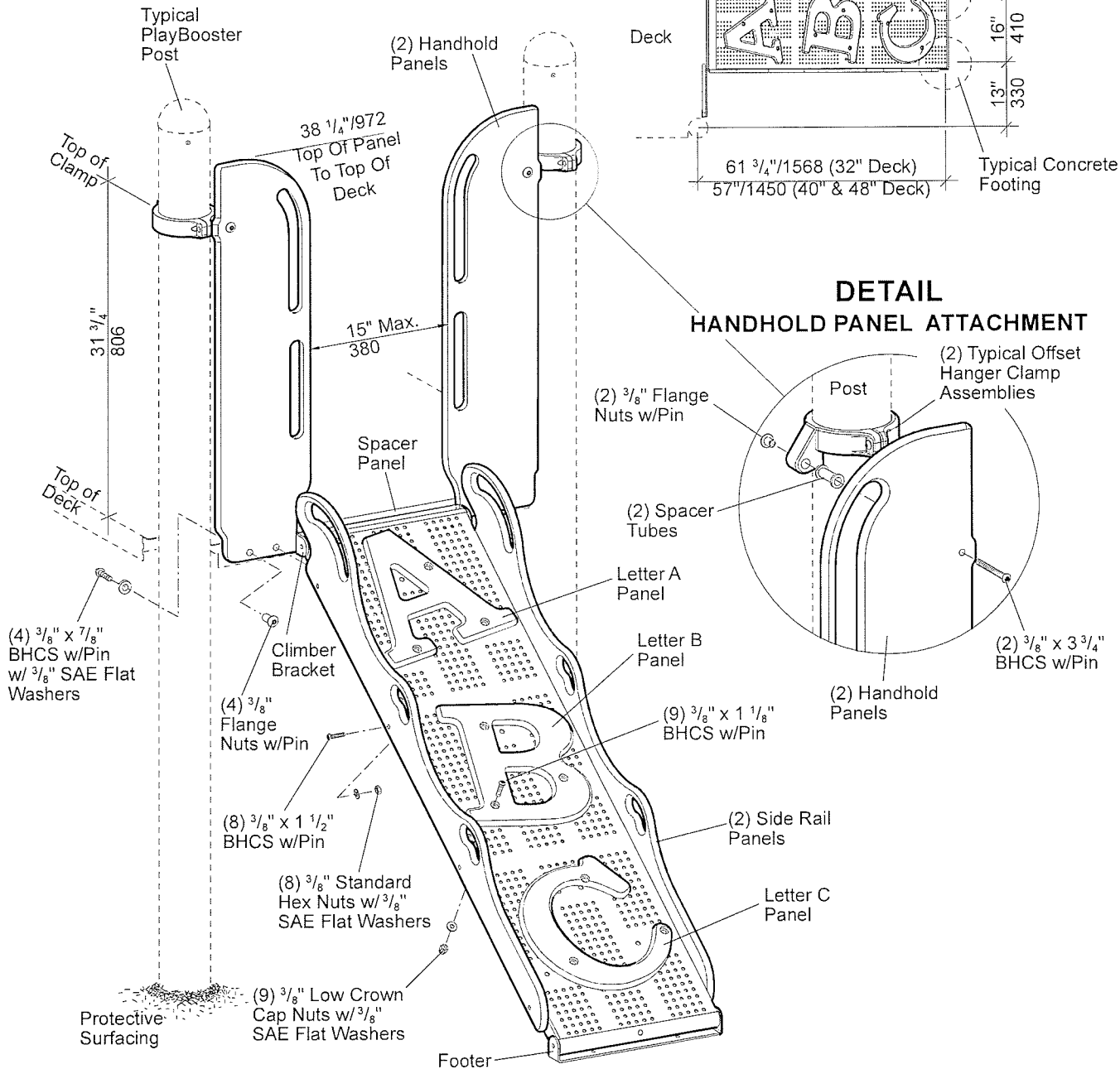
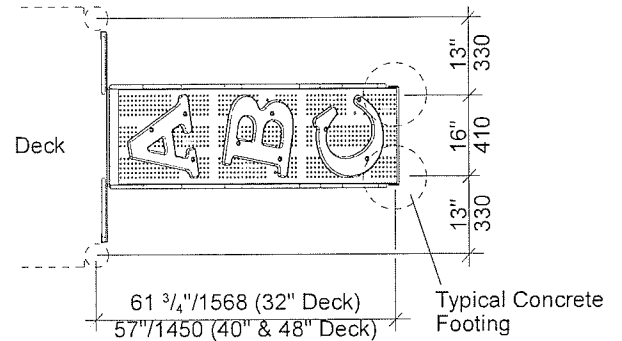


NOTE: Sufficient protective surfacing must cover hardware to satisfy fall height requirements.

**DETAIL
 DIRECT BURY**



PLAN VIEW/DB FOOTING LAYOUT





PlayBooster® 152431 ABC Climber

Parts List

Part#	Description	Qty.
152391	Climber Plank, Specify Color	1
139563	Handhold Panel, Specify Color	2
122122	Climber Bracket, Specify Color	1
113729	Offset Hanger Clamp, Specify Color	2
105327	5" Half Clamp, Specify Color	2
122776	Spacer Panel, Specify Color	1
122131	Footer (DB), Specify Color	1
122646	Footer (SM) 32" & 40", Specify Color	1
137805	Footer (SM) 48", Specify Color	1
113468	7/8" O.D. x 1 11/16" Spacer Tube, Specify Color	2
152446	Letter A Panel, Red w/Black	1
152447	Letter B Panel, Yellow w/Black	1
152448	Letter C Panel, Blue w/Black	1
152449	Side Rail Panel, Specify Color	2
100610	1/4" x 5/8" Drive Rivet AL/SST	2
203886	ABC Climber Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	17
100327	3/8" Standard Hex Nut, SST	14
100351	3/8" Tee Nut, SST	4
100353	3/8" Flange Nut w/Pin, SST	6
100365	3/8" SAE Flat Washer, SST	31
123224	3/8" x 1 11/16" BHCS w/Pin, SST	2
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2
100171	3/8" x 1 1/2" BHCS w/Pin, SST	8
100349	3/8" Low Crown Cap Nuts, SST	9
111392	2 Hole (SM) Hardware Package	1
100266	1/2" x 2 3/4" Expansion Anchor	2
100322	1/2" Standard Hex Nut, SST	2
100363	1/2" Flat Washer, SST	2
111394	4 Hole (SM) 48" Hardware Package	1
100263	3/8" x 2 3/4" Expansion Anchor	4
100327	3/8" Standard Hex Nut, SST	4
100362	3/8" Flat Washer, SST	4

DB=Direct Bury
SM=Surface Mount

Specifications

Climber Plank:	Flange formed from 11 GA (.120") sheet steel conforming to ASTM A1011. Standing surface is perforated with 5/16" diameter holes. Finish: TenderTuff®, color specified.
Climber Bracket:	Fabricated from formed 3/16" x 2" HRPO steel sheet. Finish: ProShield®, color specified.
Footer:	Weldment comprised of 1.660" O.D. RS-20 (.085"-.095") galvanized steel tubing and 3/16" x 2" HR flat steel. Finish: ProShield, color specified.
Panels:	Recycled Permalene®, color specified.
Clamps:	Cast aluminum. Finish: ProShield, color specified.
Fasteners:	Primary fasteners are socketed and pinned tamper-proof in design, either stainless steel (SST) or carbon steel plated with zinc/nickel and iridescent chromate finish.
Installation Time:	SM - Approx. 2 man hours DB - Approx. 2 1/2 man hours
Concrete Req.:	Approx. 2 cu. ft.
Area Req.:	6' (1830 mm) minimum use zone at exit
Weight:	SM - 122 lbs. (32" & 40" Deck Height) SM - 126 lbs. (48" Deck Height) DB - 130 lbs.
Fall Height:	Deck Height

Specifications are subject to change without notice.

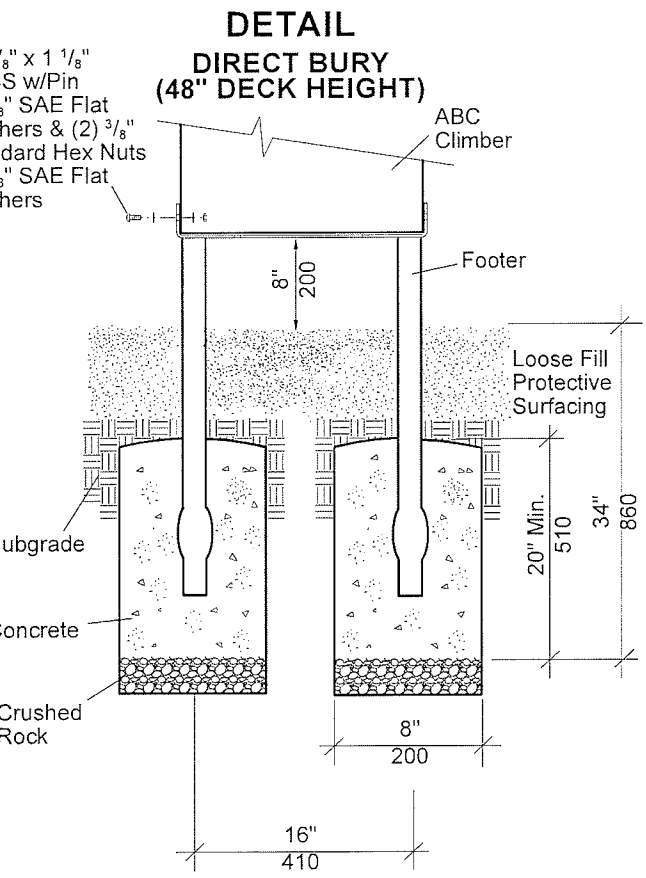
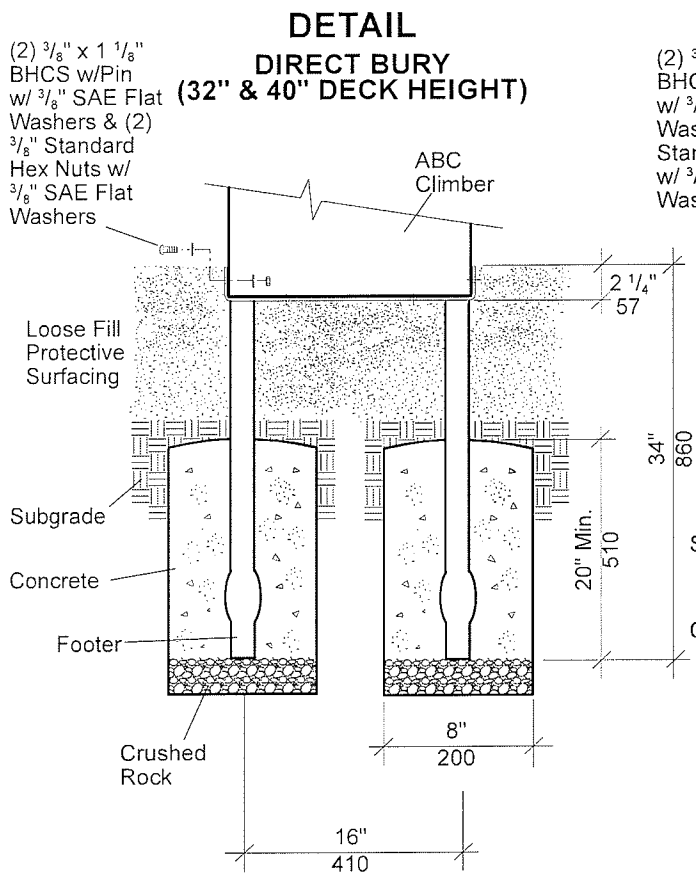
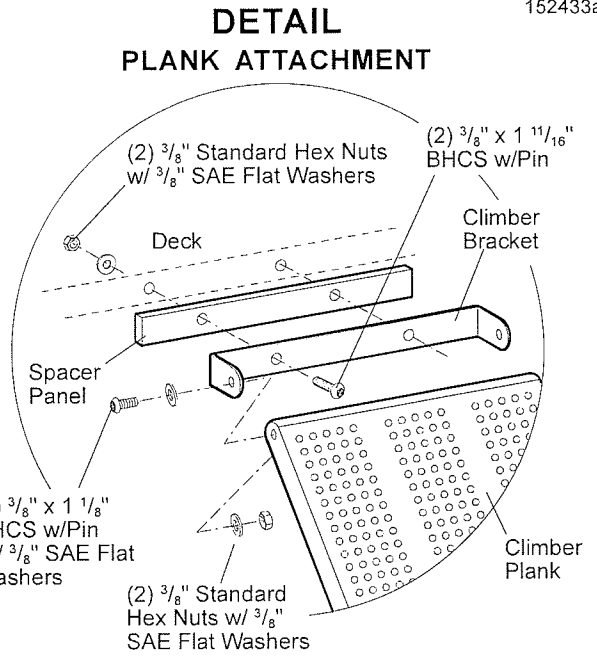
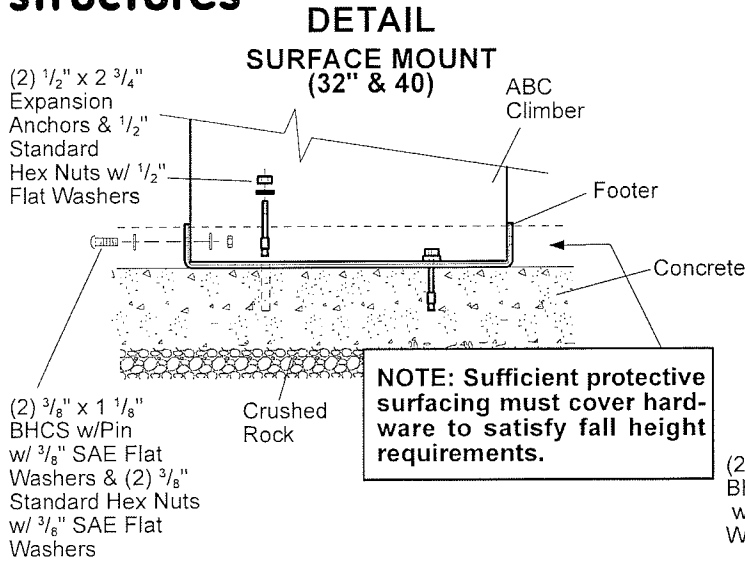
Installation Instructions

- 1) Dig footing holes spaced as shown.
- 2) Attach handhold panels to the face of the deck using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" flange nuts w/pin. See Detail.
- 3) Attach offset hanger clamp assemblies to posts at height shown. Using half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 4) Attach handhold panels to offset hanger clamp assemblies using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. See Panel Attachment Detail.
- 5) Attach letter panels A, B and C to the climber plank using 3/8" x 1 1/8" BHCS w/pin and 3/8" low crown cap nuts with 3/8" SAE flat washers.
- 6) Attach side rail panels to the climber plank using 3/8" x 1 1/2" BHCS w/pin and 3/8" standard hex nuts with 3/8" SAE flat washers.
- 7) Attach climber plank to climber bracket and footer using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to the Plank Attachment Detail.
- 8) Attach climber bracket and spacer panel to the face of the deck using 3/8" x 1 11/16" BHCS w/pin and 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to the Plank Attachment Detail.
- 9) **(Direct Bury)** With ABC climber in final position, pour concrete footings. Allow concrete footings to cure a minimum of 72 hours before users are allowed to play on the structure. **NOTE: When installing a ABC climber off of a 48" deck, the ABC climber will have to be blocked in position prior to pouring concrete footing.**
(Surface Mount 32" & 40") Mark anchor bolt locations on concrete slab through holes in footer and remove ABC climber from climber bracket. Drill 1/2" x 3" deep holes on marks into concrete using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Reposition ABC climber and reattach to the climber bracket. Fasten footer to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
(Surface Mount 48") Mark anchor bolt locations on concrete slab through holes in footer and remove ABC climber from climber bracket. Drill 3/8" x 3" deep holes on marks into concrete using hammer drill and 3/8" masonry bit. Tap expansion anchors into drilled holes. Reposition ABC climber and reattach to the climber bracket. Fasten footer to expansion anchors using 3/8" standard hex nuts with 3/8" flat washers.
- 10) Install 1/4" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 11) Install protective surfacing before users are allowed to play on the structure.

Eco #0100996 Document 22578700 replaces 20387800. Updated Panel Specification to Recycled permalene.

SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

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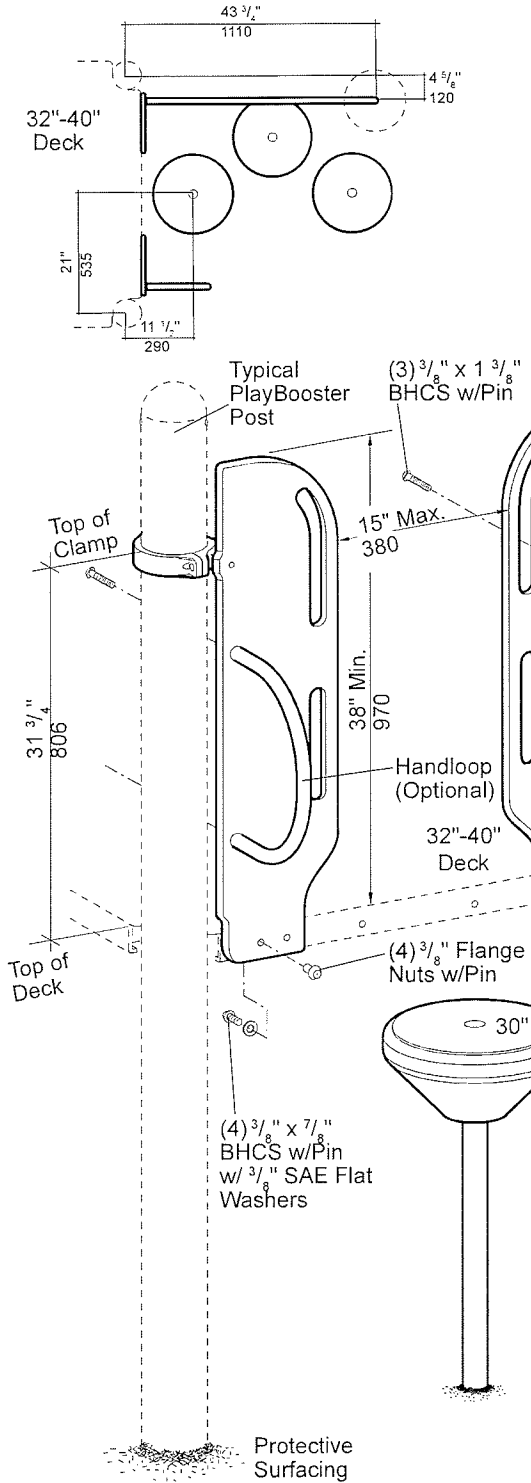
NOTE: Refer to Site Plan for additional footing locations.



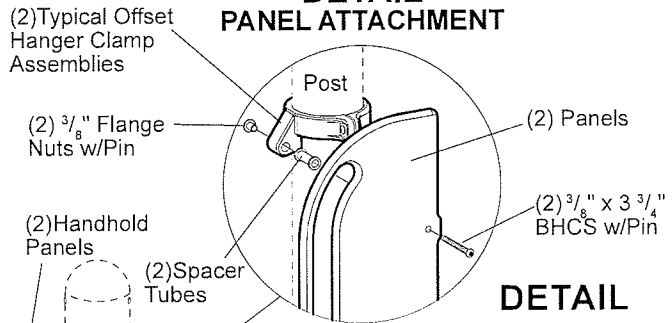
SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

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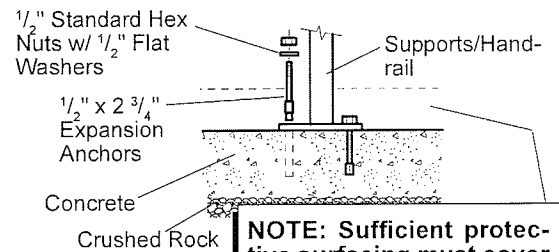
PLAN VIEW/FOOTING LAYOUT



**DETAIL
 PANEL ATTACHMENT**

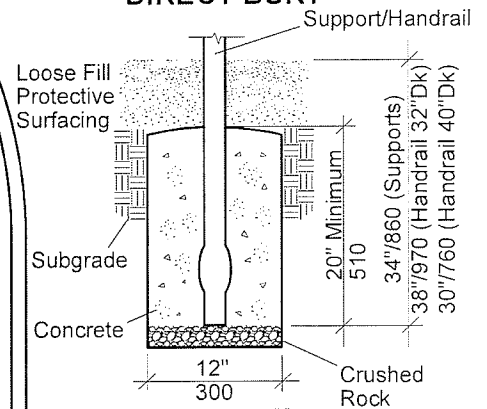


**DETAIL
 SURFACE MOUNT**

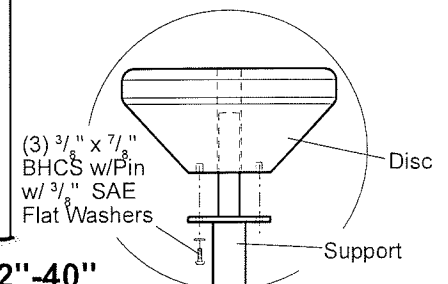


NOTE: Sufficient protective surfacing must cover hardware to satisfy fall height requirements.

**DETAIL
 DIRECT BURY**



**DETAIL
 DISC ATTACHMENT**



PlayBooster® 157427 Pod Climber®, 32"-40"



PlayBooster® 157427 Pod Climber®, 32"-40"

Parts List

Part#	Description	Qty.
		32"-40" Dk-Dk
126956	Disc, Specify Color	3 3
139563	Handhold Panel, Specify Color	2 2
135553	Handloop, (Optional) Specify Color	1 1
135075	Handrail (DB),(Opt) (32"/40"Deck),Specify Color	1 1
135077	Handrail (SM),(Opt) (32" Deck), Specify Color	1 -
135076	Handrail (SM),(Opt) (40" Deck, Specify Color	- 1
113468	Spacer Tube, Specify Color	2 2
105327	5" Half Clamp, Specify Color	2 2
113729	Offset Hanger Clamp, Specify Color	2 2
100610	1/4" x 3/8" Drive Rivet, SST	2 2
156623	Support 10" (SM), Specify Color	1 1
156624	Support 10" (DB), Specify Color	1 1
156625	Support 20" (SM), Specify Color	1 1
156627	Support 20" (DB), Specify Color	1 1
153987	Support 30" (SM), Specify Color	1 1
153988	Support 30" (DB), Specify Color	1 1
184986	Disc Climber Hardware Package	3 3
100196	3/8" x 7/8" BHCS w/Pin, SST	9 9
100365	3/8" SAE Flat Washer, SST	9 9
139861	Handhold Hardware Package	2 2
100196	3/8" x 7/8" BHCS w/Pin, SST	4 4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	4 4
100351	3/8" Tee Nut, SST	4 4
100353	3/8" Flange Nut w/Pin, SST	6 6
100365	3/8" SAE Flat Washer, SST	4 4
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2 2
135605	Handloop Hardware Package (Optional)	1 1
113027	3/8" x 1 3/8" BHCS w/Pin, SST	3 3
111392	2 Hole (SM) Hardware Package (Optional)	1 1
100266	1/2" x 2 3/4" Expansion Anchor	2 2
100322	1/2" Standard Hex Nut, SST	2 2
100363	1/2" Flat Washer, SST	2 2
121348	4 Hole (SM) Hardware Package	3 3
100266	1/2" x 2 3/4" Expansion Anchor	12 12
100322	1/2" Standard Hex Nut, SST	12 12
100363	1/2" Flat Washer, SST	12 12

DB = Direct Bury
SM=Surface Mount

Specifications

Disc: Rotationally molded from U.V. stabilized linear low density polyethylene, disc measures 14" in diameter x 7" high, color specified.

Handhold Panel: Solid color Permalene®, color specified.

Handloop: Weldment comprised of 1.125" O.D. 11 GA (.120") steel tubing with 203 or 303 stainless steel inserts, with 3/8" internal thread. Finish: TenderTuff®, color specified.

Handrail: Weldment comprised of 1.125" O.D. 11 GA (.120") steel tubing with 203 or 303 stainless steel inserts, with 3/8" internal thread. Finish: TenderTuff®, color specified.

Support: Weldment comprised of 1.900" O.D. RS-20 (.090" - .100"), 1.315" O.D. RS-20 (.080" - .090") and 3/16" x 5" diameter plate. Finish: ProShield®, color specified.

Spacer Tube: Made from 6061-T6 aluminum 7/8" O.D. x 1 1/16". Finish: ProShield®, color specified.

Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: SM - Approx. 2 man hours
DB - Approx. 3 1/4 man hours

Concrete Req.: Approx. 5.2 cu. ft.

Weight:

32"-40" Decks - 65 lbs. (DB) 2 Handholds
32"-40" Decks - 68 lbs. (SM) 2 Handholds
32"-40" Decks - 69 lbs. (DB) 2 Handholds & 1 Handloop
32"-40" Decks - 72 lbs. (SM) 2 Handholds & 1 Handloop
32"-40" Decks - 81 lbs. (DB) 2 Handholds & 1 Handrail
32"-40" Decks - 85 lbs. (SM) 2 Handholds & 1 Handrail
32"-40" Decks - 85 lbs. (DB) 2 Handholds, 1 Handloop & 1 Handrail
32"-40" Decks - 89 lbs. (SM) 2 Handholds, 1 Handloop & 1 Handrail

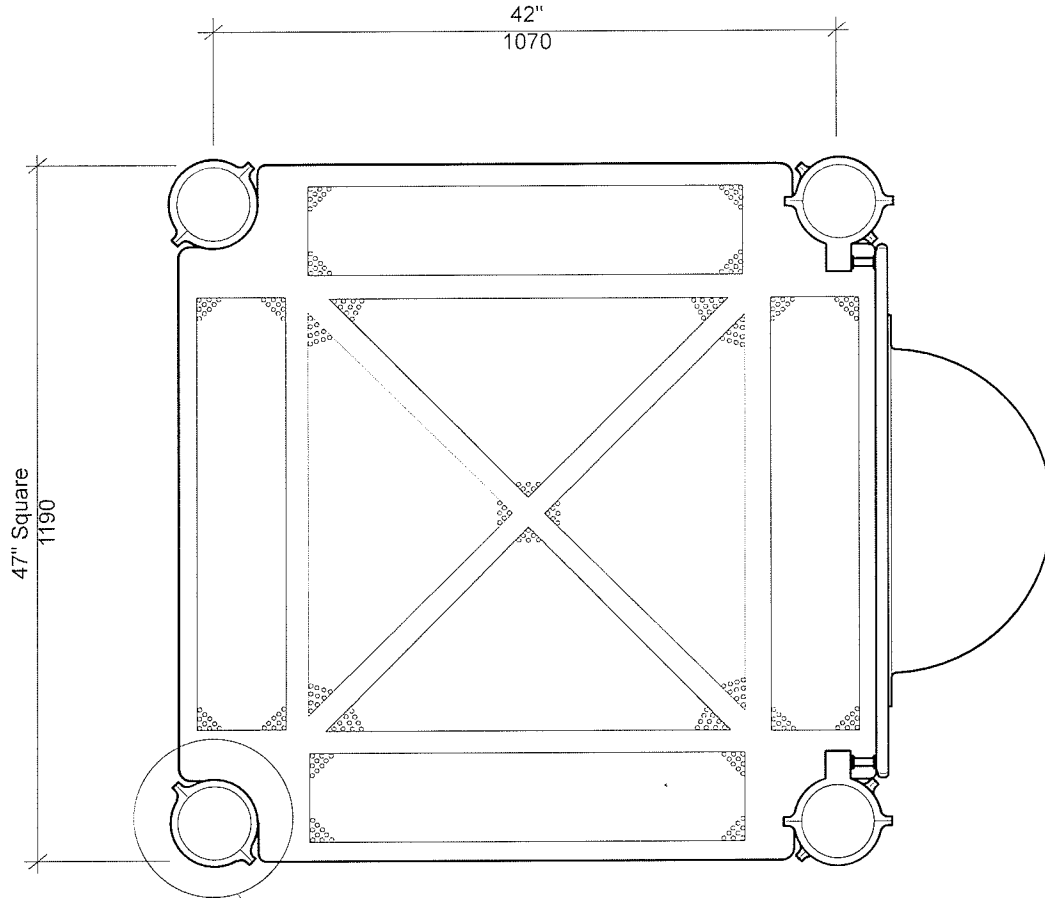
Fall Height: Deck Height

Installation Instructions

- (Direct Bury)** Dig footings spaced as shown. **NOTE:** Refer to Site Plan for footing locations.
 - Attach discs to supports using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers, as shown.
 - Attach handhold panels to the face of the deck using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washer and 3/8" flange nut w/pin.
 - Attach offset hanger clamps to posts at height shown using 5" half clamp, 3/8" x 1 1/8" BHCS w/pin and 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
 - Attach handhold panels to the offset hanger clamp assemblies using 3/8" x 3 3/4" BHCS w/pin, spacer tube and 3/8" flange nut w/pin. Refer to the Panel Attachment Detail. Using a 7/16" drill bit, drill out 1/8" pilot holes in each handhold panel to attach handloop & handrail (Optional).
 - Position handrail (Optional) and attach to handhold panel using 3/8" x 1 3/8" BHCS w/pin.
 - Attach handloop (Optional) to handhold panel using 3/8" x 1 3/8" BHCS w/pin.
 - (Direct Bury)** Position supports in footing holes and pour concrete footings. With support posts plumb, prop supports to hold in position. Allow concrete footings to cure a minimum of 72 hours before users are allowed to play on the structure.
- (Surface Mount)** Mark anchor bolt locations on concrete slab through holes in anchor plates. Remove supports with disc. Drill 1/2" x 3" deep holes on marks into concrete using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Fasten anchor plates to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
- Install protective surfacing before users are allowed to play on the structure.

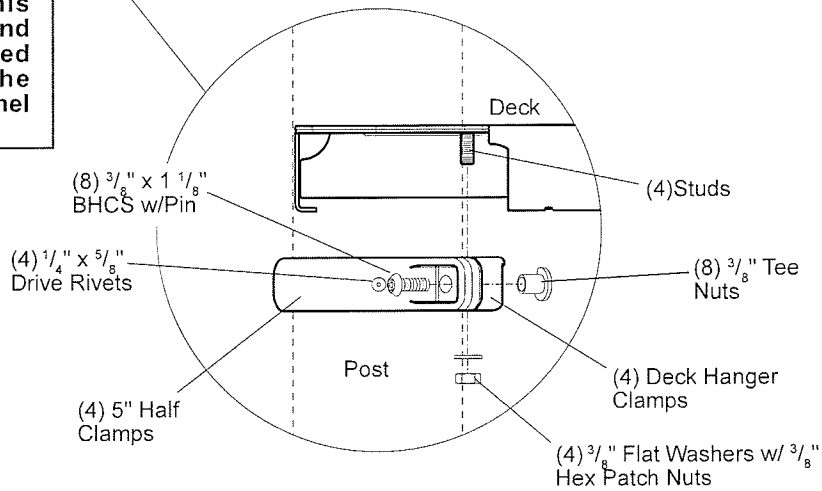
Specifications are subject to change without notice.

Eco #0100484 Document #20689100 replaces #18500100. Added Refer to Site Plan note.



**DETAIL
DECK HANGER CLAMP**

NOTE: When using this deck, ALL enclosures and components are mounted on the **OUTSIDE** of the posts like the bubble panel shown above.





PlayBooster® 111228 Square Deck

Parts List

Part#	Description	Qty.
145656	Tenderdeck, Specify Color	1
105327	5" Half Clamp, Specify Color	4
106022	5" Deck Hanger Clamp, Specify Color	4
119491	Hardware Package	1
100198	$\frac{3}{8}$ " x $1 \frac{1}{8}$ " BHCS w/Pin, SST	8
100321	$\frac{3}{8}$ " Hex Patch Nut, SST	4
100351	$\frac{3}{8}$ " Tee Nut, SST	8
100362	$\frac{3}{8}$ " Flat Washer, SST	4
100610	$\frac{1}{4}$ " x $\frac{5}{8}$ " Drive Rivet, SST	4

Specifications

Square Deck: Flange formed from 12 GA (.105") sheet steel conforming to ASTM A1011. Standing surface is perforated with $\frac{5}{16}$ " diameter holes. Deck face has (4) slotted holes for face mounting components. The finished size measures $2 \frac{5}{8}$ " x 47" x 47". Finish: TenderTuff™, color specified.

Deck Hanger

Clamp Assembly: Cast aluminum. Finish: ProShield®, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

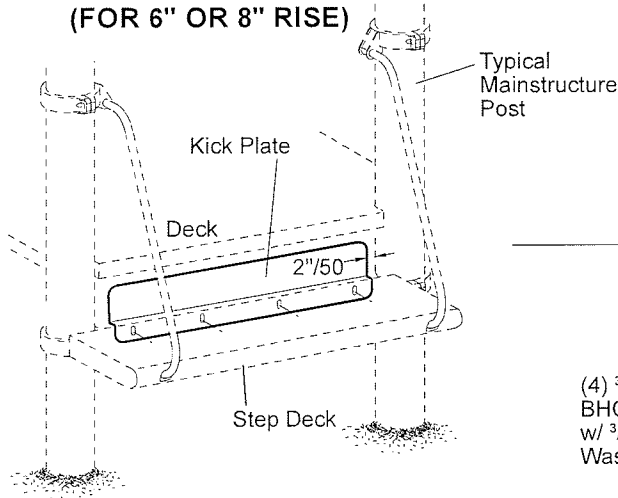
Installation Time: Approx. 1 man hour

Weight: 119 lbs.

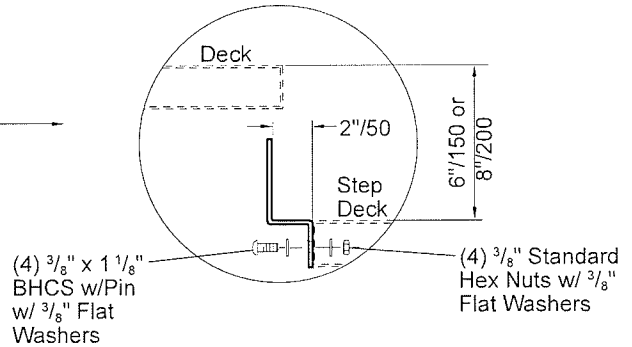
Installation Instructions

- 1) Mark posts for the appropriate height of the deck you are installing.
- 2) Fasten hanger clamps to marked position on posts. See Detail on front of sheet.
- 3) Lift deck into position, lining up studs underneath deck with deck hanger clamp as shown. Attach with $\frac{3}{8}$ " flat washers and $\frac{3}{8}$ " hex patch nuts.
- 4) Level deck and plumb posts. Install the drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 5) After all enclosures/components are installed, pour concrete footings per the Typical Concrete Footing Detail Sheet.
- 6) Install protective surfacing before users are allowed to play on the structure.

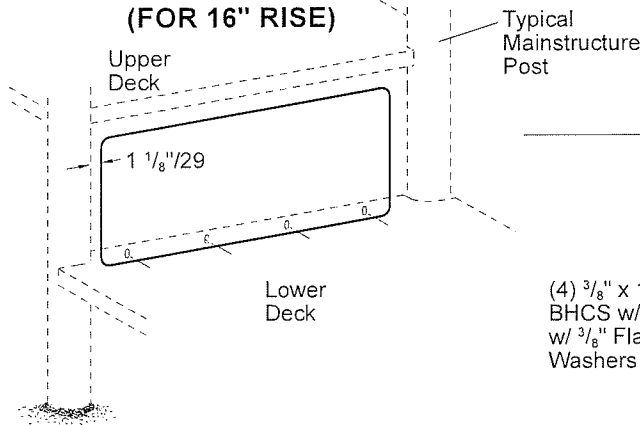
**KICK PLATE
(FOR 6" OR 8" RISE)**



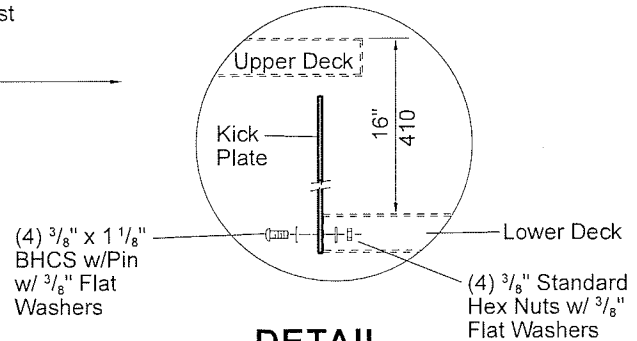
**DETAIL
KICK PLATE ATTACHMENT
(FOR 6" OR 8" RISE)**



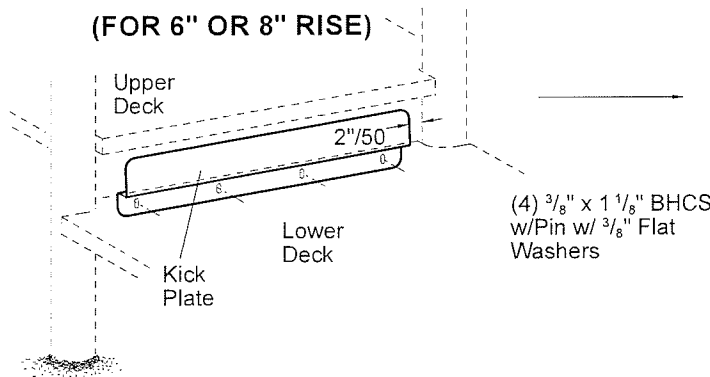
**KICK PLATE
(FOR 16" RISE)**



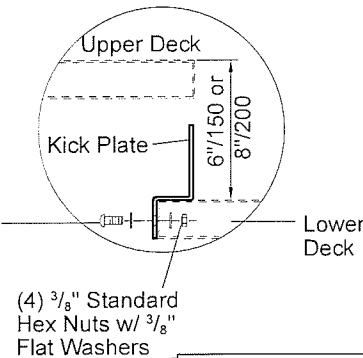
**DETAIL
KICK PLATE ATTACHMENT
(FOR 16" RISE)**



**KICK PLATE
(FOR 6" OR 8" RISE)**



**DETAIL
KICK PLATE ATTACHMENT
(FOR 6" OR 8" RISE)**



NOTE: Kick Plates mount to face of lower deck.

PlayBooster® 121948 Kick Plates, Tenderdecks, 6", 8" & 16"

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Document #18161000



PlayBooster® 121948 Kick Plates, Tenderdecks, 6", 8" & 16"

Parts List

Part#	Description	Qty.
121819	Kick Plate (For 6" or 8" Rise), Specify Color.....	1
121818	Kick Plate (For 16" Rise), Specify Color.....	1
156058	Kick Plate Tenderdeck Hardware Package	1
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST.....	4
100327	$\frac{3}{8}$ " Standard Hex Nut, SST	4
100362	$\frac{3}{8}$ " Flat Washer, SST	8

Specifications

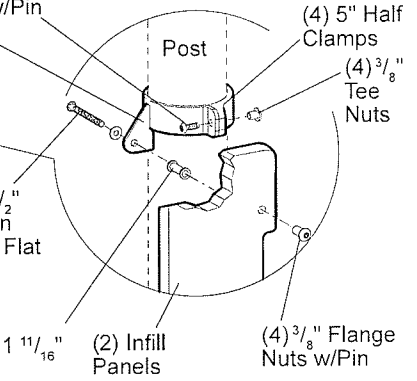
- Kick Plate:** Fabricated from 11 GA (.120") HR flat steel. Finish: TenderTuff™, brown or gray in color.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Approx. $\frac{1}{4}$ man hour
- Weight:** Kick Plate (For 6" or 8" Rise) 13 lbs.
Kick Plate (For 16" Rise) 23 lbs.

Installation Instructions

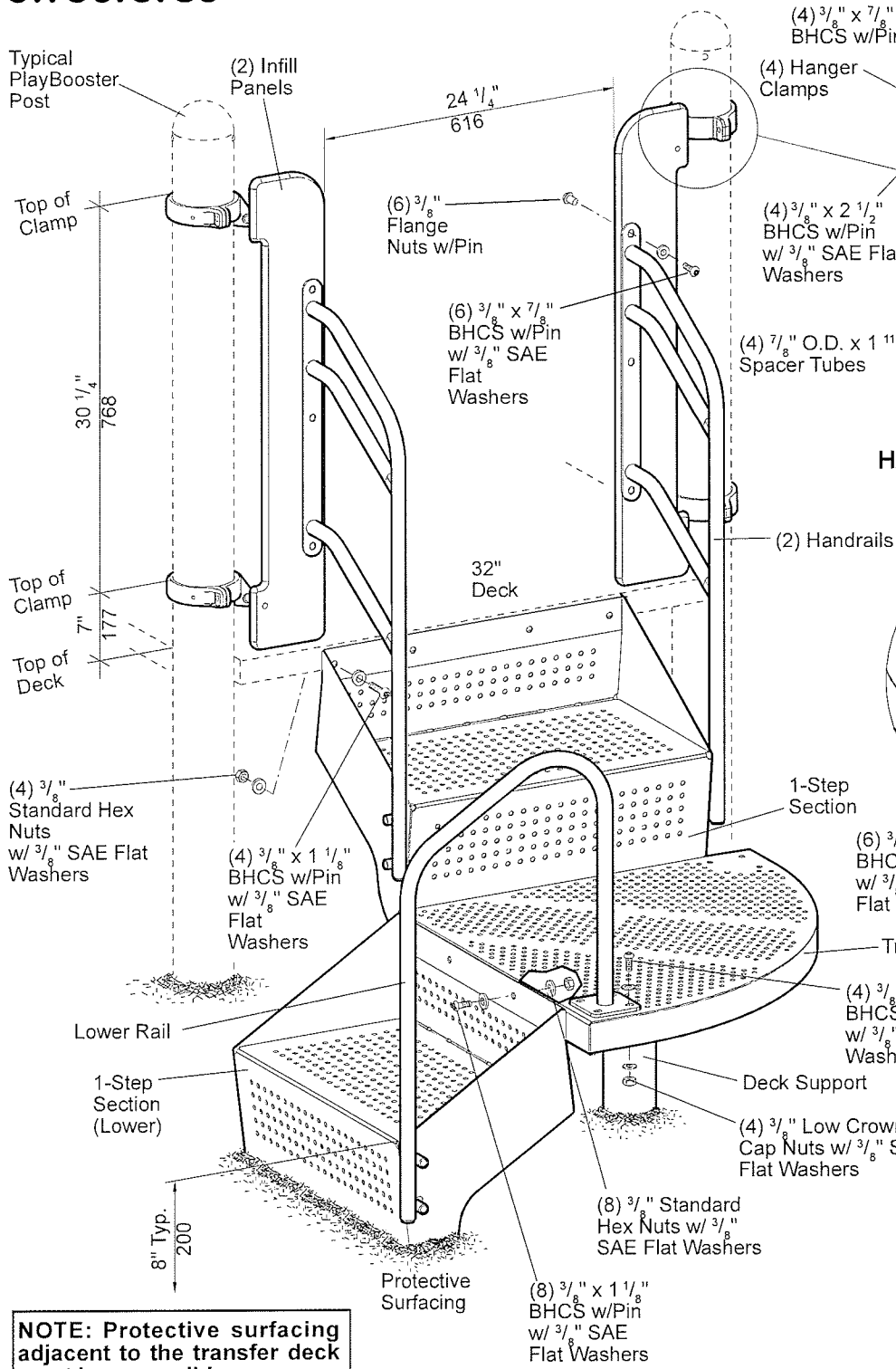
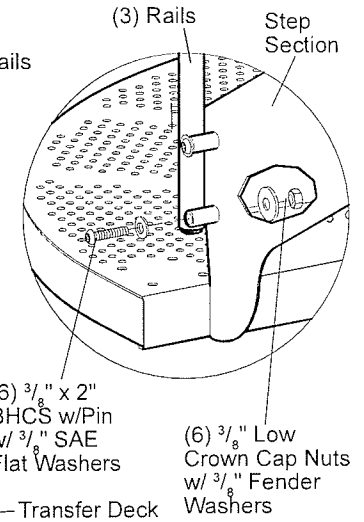
- 1) Locate kick plates as labeled on your plan drawing.
- 2) Attach kick plate using $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " flat washers and $\frac{3}{8}$ " standard hex nuts with $\frac{3}{8}$ " flat washers, as shown. **NOTE:** *Kick plates mount to face of lower deck.*
- 3) Install protective surfacing before users are allowed to play on the structure.

Specifications are subject to change without notice.

**DETAIL
PANEL ATTACHMENT**



**DETAIL
HANDRAIL ATTACHMENT**



NOTE: Protective surfacing adjacent to the transfer deck must be accessible.

PlayBooster® 184354 Transfer Module, 32", w/Handrails



PlayBooster® 184354 Transfer Module, 32", w/Handrails

Parts List

Part#	Description	Qty.
100610	1/2" x 3/8" Drive Rivet, AL/SST	4
105327	5" Half Clamp, Specify Color	4
185741	Steel Hanger Clamp, Specify Color	4
181371	Deck Support (DB), Specify Color	1
181373	Deck Support (SM), Specify Color	1
181374	Step Support (DB), Specify Color	1
181376	Step Support (SM), Specify Color	1
144696	1-Step Section, Specify Color	2
175516	1-Step Handrail, Specify Color	2
152641	Lower Rail, Specify Color	1
153398	Transfer Deck, Specify Color	1
184254	Infill Panel, Specify Color	2
113468	7/8" O.D. x 1 11/16" Spacer Tube, Specify Color	4
204037	Transfer Module Hardware Package	1
100173	3/8" x 2" BHCS w/Pin, SST	6
100196	3/8" x 7/8" BHCS w/Pin, SST	16
100198	3/8" x 1 3/8" BHCS w/Pin, SST	16
100327	3/8" Standard Hex Nut, SST	16
100351	3/8" Tee Nut, SST	8
100353	3/8" Flange Nut w/Pin, SST	10
100365	3/8" SAE Flat Washer, SST	58
113027	3/8" x 1 3/8" BHCS w/Pin, SST	4
100174	3/8" x 2 1/2" BHCS w/Pin, SST	4
100378	3/8" Fender Washer, SST	6
100349	3/8" Low Crown Cap Nut, SST	12
111393	4-Hole (SM) Hardware Package	1
100263	3/8" x 2 3/8" Expansion Anchors	4
100327	3/8" Standard Hex Nut, SST	4
100365	3/8" SAE Flat Washers, SST	4
121256	2-Hole (SM) Hardware Package	1
100263	3/8" x 2 3/8" Expansion Anchors	2
100327	3/8" Standard Hex Nut, SST	2
100365	3/8" SAE Flat Washers, SST	2

DB=Direct Bury
SM=Surface Mount

Specifications

Deck:	Flange formed from 12 GA (.105") sheet steel conforming to ASTM A1011. Standing surface is perforated with 3/16" diameter holes and measure 29" per (2) sides. Finish: TenderTuff™, color specified.
Railings:	Weldment comprised of formed 1 1/2" O.D. x 11 GA (.120") steel tubing, 3/16" thick HR flat steel, 3/16" thick HRPO steel plate and 3/4" O.D. x 11 GA (.120") stainless steel tubing. Finish: TenderTuff, color specified.
Step Sections:	Formed from 12 GA (.105") sheet steel conforming to ASTM A1011. Standing surface is 24 3/8" wide x 14" deep and is perforated with 3/16" diameter holes. Finish: TenderTuff, color specified.
Spacer Tube:	Made from 6061-T6 aluminum 7/8" O.D. x 1 11/16". Finish: ProShield®, color specified.
Infill Panel:	Solid color Permalene® panel, color specified.
Deck Support:	Weldment comprised of 3 1/2" O.D. RS20 (.125") galvanized steel tubing and 3/2" O.D. x 5" long rod. Finish: ProShield, color specified.
Step Support:	Weldment comprised of 1.660 O.D. RS20 (.080"-.095) and 1 3/4" x 1 3/4" x 1/8" HR angle. Finish: ProShield, color specified.
Stl. Hanger Clamp:	Weldment comprised of 1/2" HRPO flat steel. Finish: ProShield®, color specified.
Clamp:	Cast aluminum. Finish: ProShield, color specified.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Specifications are subject to change without notice.

Installation Time:	SM - Approx. 3 man hours DB - Approx. 4 man hours
Concrete Req.:	Approx. 2.94 cu. ft.
Weight:	SM - 195 lbs. DB - 210 lbs.
Fall Height:	Deck Height

Installation Instructions

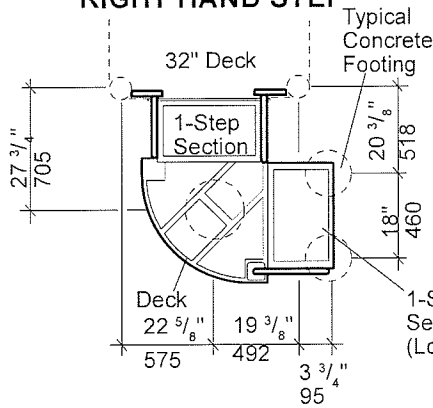
- (Direct Bury)** Dig footings as shown. Refer to your Plan View/Footing Layout.
- Attach the deck support to the transfer deck using 3/8" x 7/8" BHCS w/pin and 3/8" low crown cap nuts with 3/8" SAE flat washers. **NOTE: Make sure 3/8" rod on support is under support strap on deck as shown.** Refer to the Deck Support Attachment Detail.
- Attach the 1-step section to the transfer deck using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers.
- Attach the 1-step section to the face of the mainstructure deck using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers.
- Attach the step support to the 1-step section (lower) using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to the Step Support Attachment Detail.
- Attach the 1-step section (lower) to the transfer deck using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers.
- Attach steel hanger clamps to posts at heights shown, using 5" half clamps, 3/8" x 7/8" BHCS w/pin and 3/8" tee nuts. Refer to Panel Attachment Detail.
- Attach infill panels to steel hanger clamps, using 3/8" x 2 1/2" BHCS, 7/8" O.D. x 1 11/16" spacer tubes and 3/8" flange nuts w/pin. Refer to Panel Attachment Detail.
- Attach the handrails to the steps using 3/8" x 2" BHCS w/pin with 3/8" SAE flat washers and 3/8" low crown cap nuts with 3/8" fender washers. Refer to the Handrail Attachment Detail.
- Attach the handrails to the infill panels using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" flange nuts w/pin.
- Attach the lower rail to the transfer deck using 3/8" x 1 3/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" low crown cap nuts with 3/8" SAE flat washers.
- Attach the lower rail to the 1-step section (lower) using 3/8" x 2" BHCS w/pin with 3/8" SAE flat washers and 3/8" low crown cap nuts with 3/8" fender washers. Refer to the Handrail Attachment Detail.
- (Direct Bury)** With transfer deck and steps level and supports plumb, pour concrete footings. Allow concrete footings to cure a minimum of 72 hours before users are allowed to play on the structure.
(Surface Mount) Mark holes for expansion anchors on concrete slab through support plates. Detach the module from the mainstructure and slide module aside, drill 3/8" x 3" deep holes on marks using hammer drill and 3/8" masonry bit. Reposition module over drilled holes and tap expansion anchors into drilled holes. Fasten support plates to expansion anchors using 3/8" standard hex nuts with 3/8" SAE flat washers. Reattach module to structure.
- Install 1/2" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- Install protective surfacing before users are allowed to play on the structure.

Eco 0100178 Document 20402800 replaces 18598000. Replaced hardware package.

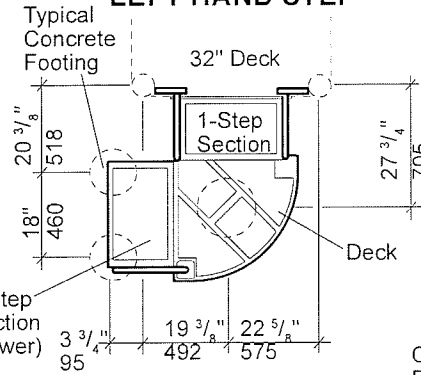
SAFETY NOTE
Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

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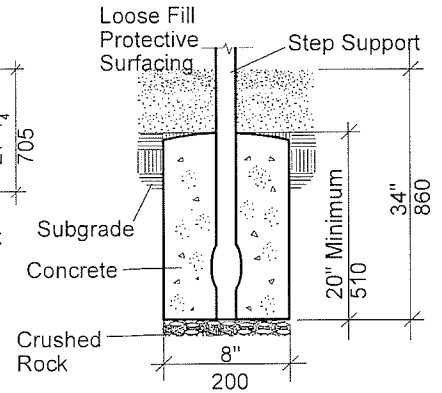
**PLAN VIEW
FOOTING LAYOUT
RIGHT HAND STEP**



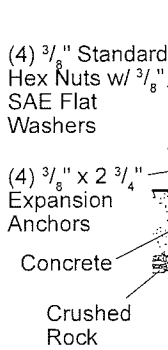
**PLAN VIEW
FOOTING LAYOUT
LEFT HAND STEP**



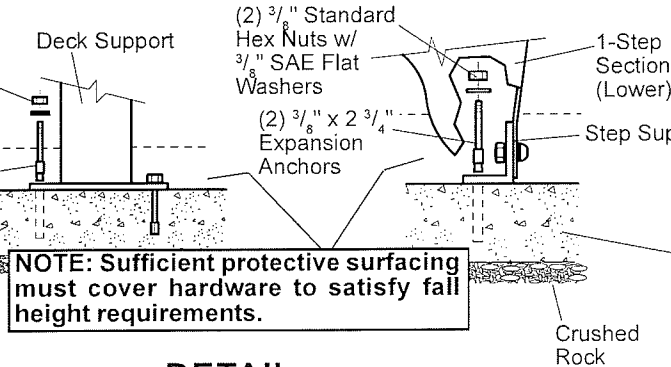
**DETAIL
STEP SUPPORT BURY**



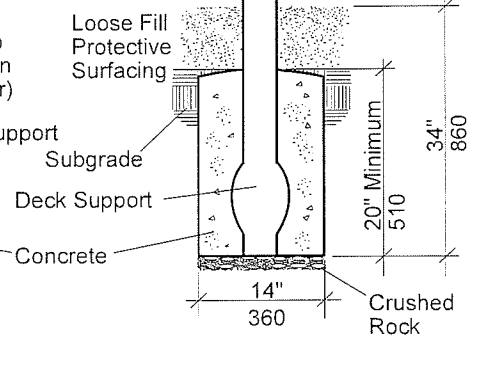
**DETAIL
SURFACE MOUNT**



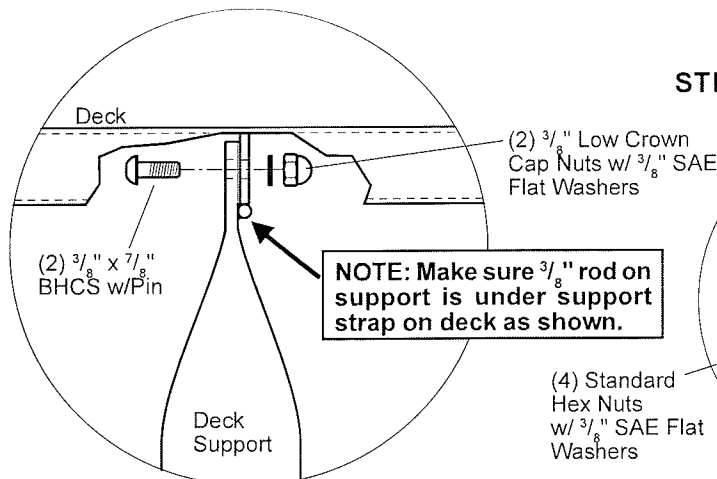
**DETAIL
SURFACE MOUNT
STEP SUPPORT**



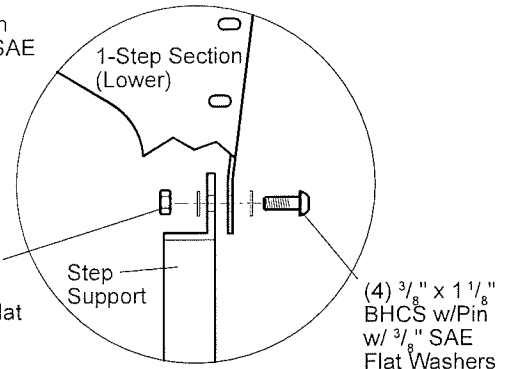
**DETAIL
DECK SUPPORT BURY**



**DETAIL
DECK SUPPORT ATTACHMENT**



**DETAIL
STEP SUPPORT ATTACHMENT**



PlayBooster® 184354 Transfer Module, 32", w/Handrails

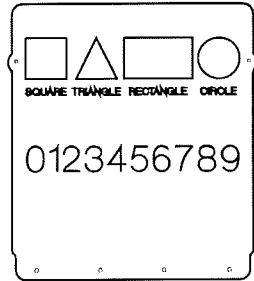
Sheet 2 of 2

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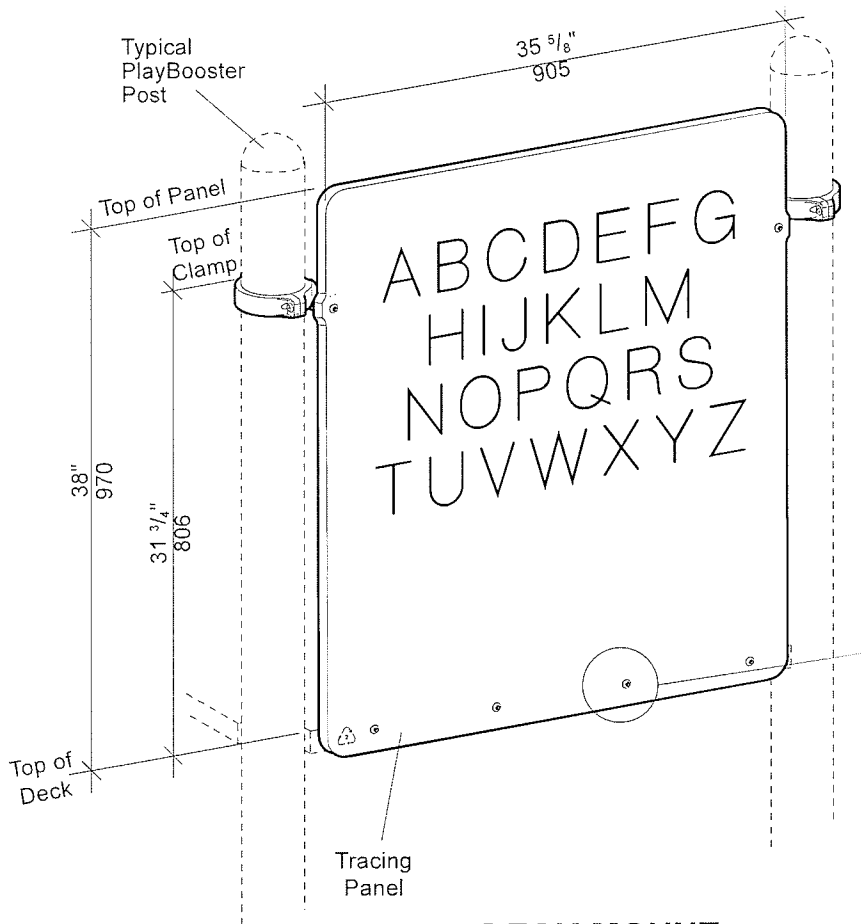
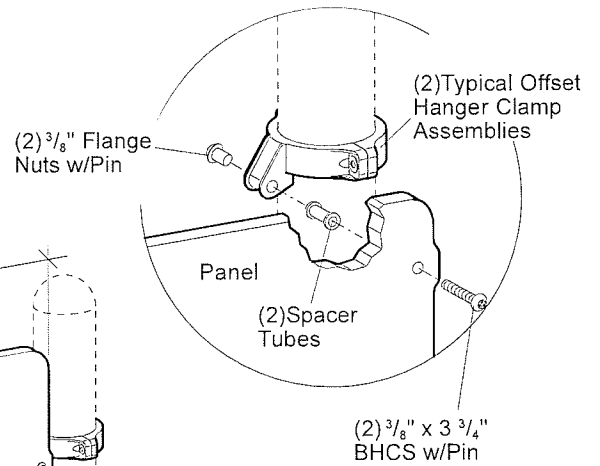
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Document #20402800

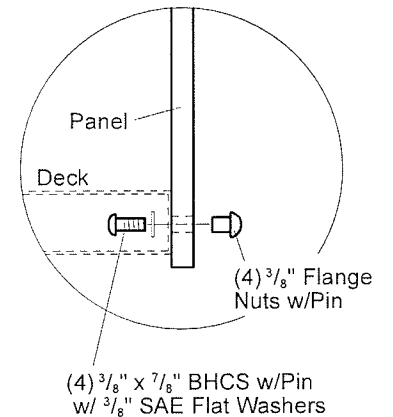
REVERSE SIDE



DETAIL
PANEL ATTACHMENT



DETAIL
TENDERDECKS



DECK MOUNT



PlayBooster® 115230 Tracing Panel

Parts List

Part#	Description	Qty.
ABOVE DECK		
105327	5" Half Clamp, Specify Color	2
113729	Offset Hanger Clamp, Specify Color	2
113468	Spacer Tube, Specify Color	2
114130	Tracing Panel, Specify Color	1
124900	Tenderdeck Mounting Hardware Package	1
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2
100196	3/8" x 7/8" BHCS w/Pin, SST	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	4
100351	3/8" Tee Nut, SST	4
100353	3/8" Flange Nut w/Pin, SST	6
100365	3/8" SAE Flat Washer, SST	4
BELOW DECK		
105327	5" Half Clamp, Specify Color	4
113729	Offset Hanger Clamp, Specify Color	4
113468	Spacer Tube, Specify Color	2
113464	Angled Panel Bracket, Specify Color	1
114130	Tracing Panel, Specify Color	1
100610	1/4" x 3/8" Drive Rivet, AL/SST	4
124947	Below Deck Mounting Hardware Package	1
124460	3/8" x 3 3/4" BHCS w/Pin, SST	2
100195	3/8" x 5/8" BHCS w/Pin, SST	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	8
100203	3/8" x 2 1/4" BHCS w/Pin, SST	2
100351	3/8" Tee Nut, SST	8
100353	3/8" Flange Nut w/Pin, SST	6

Specifications

- Permalene® Panel:** Two color panel measures 35 5/8" wide x 41" high, color specified.
- Angled Panel Brkt:** Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6061-T6 aluminum threaded tubes 1 1/8" O.D. x 1 1/2" long. Finish: ProShield®, color specified.
- Spacer Tube:** Made from 6061-T6 aluminum 7/8" O.D. x 1 1/16". Finish: ProShield, color specified.
- Offset Hanger Clamp Assembly:** Cast aluminum. Finish: ProShield, color specified.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Above Deck Approx. 3/4 man hour
Below Deck Approx. 1 man hour
- Weight:** Above Deck 43 lbs.
Below Deck 51 lbs.

Installation Instructions

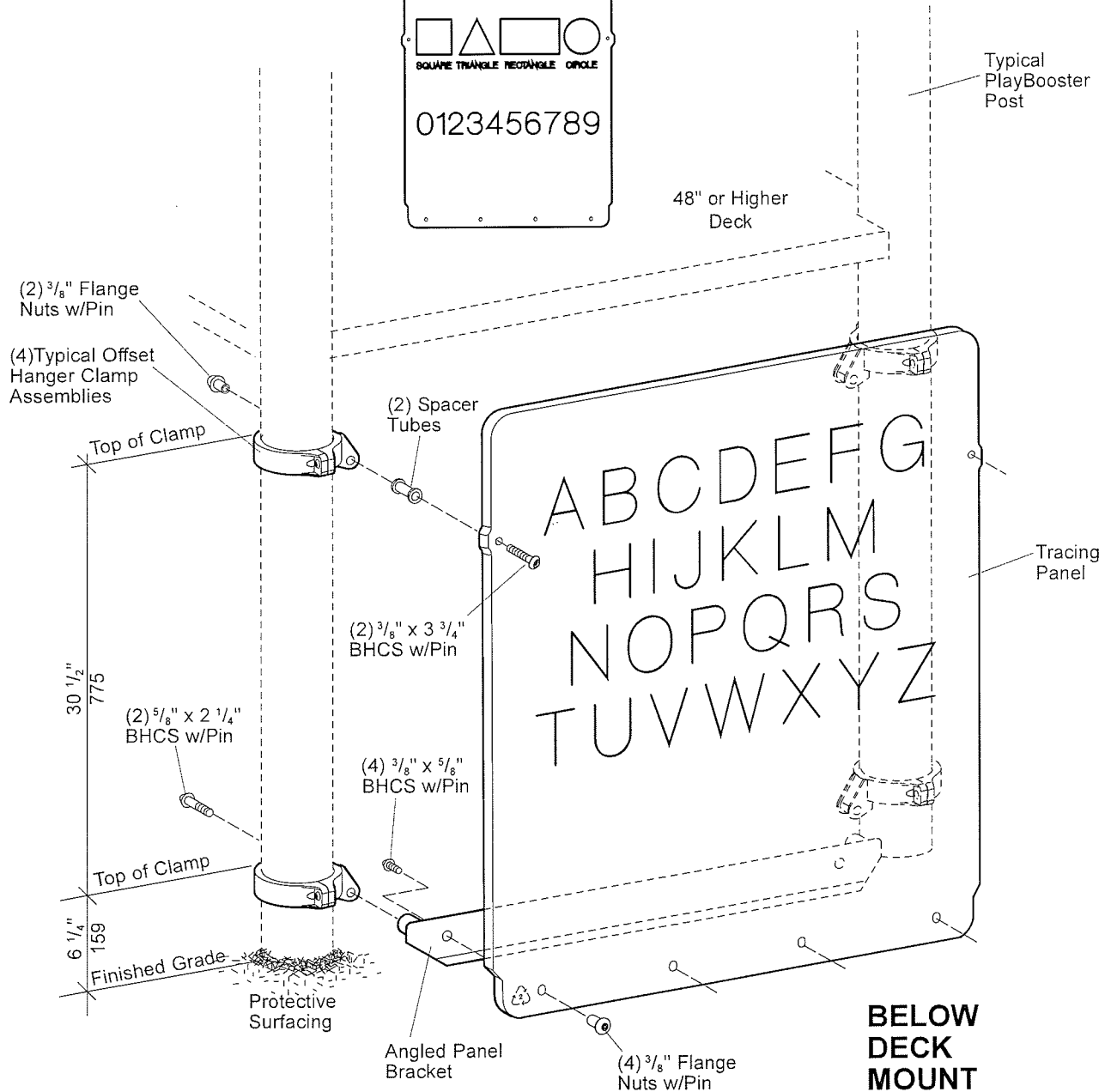
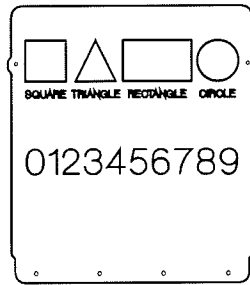
ABOVE DECK (See Sheet 1 of 2)

- 1) Attach panel to the face of the deck, using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" flange nuts w/pin. See Detail.
- 2) Attach offset hanger clamp assemblies to posts at height shown, using 5" half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 3) Attach panel to offset hanger clamp assemblies, using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. See Panel Attachment Detail.
- 4) Install protective surfacing before users are allowed to play on the structure.

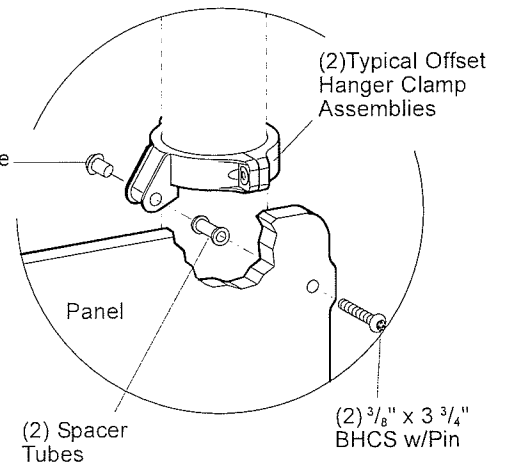
BELOW DECK (See Sheet 2 of 2)

- 1) Attach offset hanger clamp assemblies to posts at height shown, using half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach angled panel bracket to bottom of panel, using 3/8" x 3/8" BHCS w/pin and 3/8" flange nuts w/pin. See Below Deck Mount.
- 3) Attach angled panel bracket with panel to offset hanger clamp assemblies using 3/8" x 2 1/4" BHCS w/pin. See Below Deck Mount.
- 4) Attach top of panel to offset hanger clamp assemblies, using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. See Typical Attachment To Post Detail.
- 5) Install 1/4" x 3/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 6) Install protective surfacing before users are allowed to play on the structure.

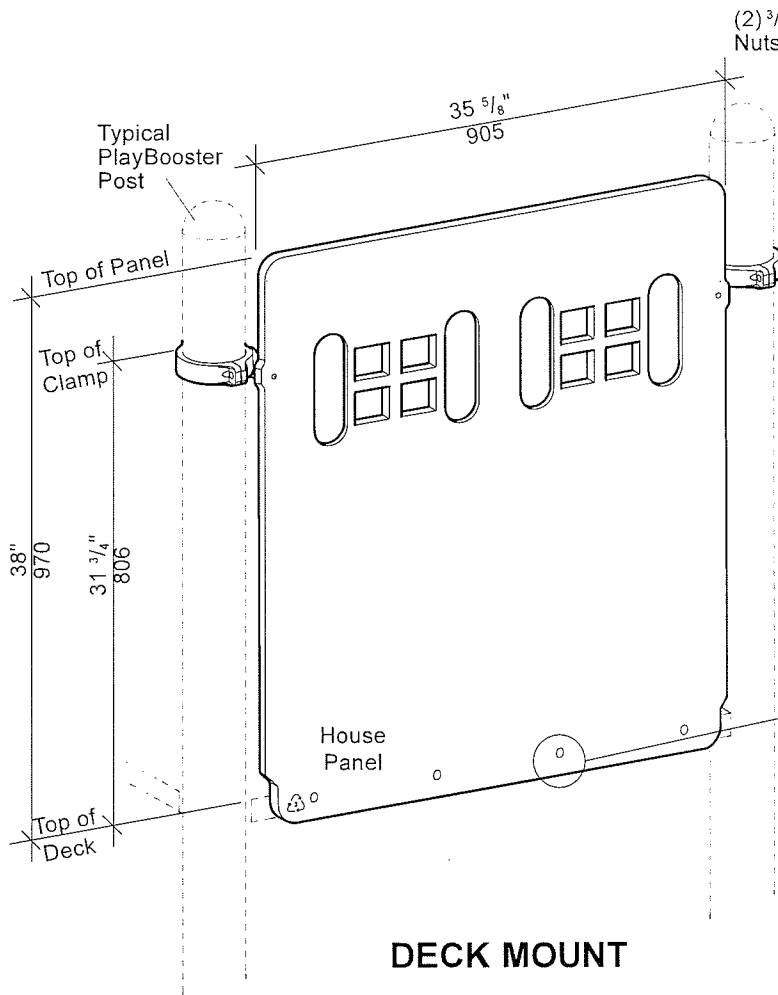
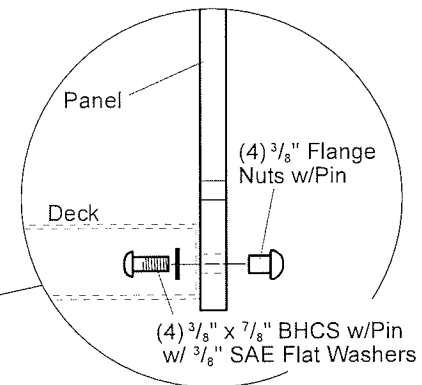
REVERSE SIDE



**DETAIL
PANEL ATTACHMENT**



**DETAIL
TENDERDECKS**





PlayBooster® 115235 House Panel

Parts List

Part#	Description	Qty.
ABOVE DECK		
105327	5" Half Clamp, Specify Color	2
113729	Offset Hanger Clamp, Specify Color	2
113468	Spacer Tube, Specify Color	2
117329	House Panel, Specify Color	1
124900	Tenderdeck Mounting Hardware Package	1
124460	$\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/Pin, SST	2
100196	$\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/Pin, SST	4
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST	4
100351	$\frac{3}{8}$ " Tee Nut, SST	4
100353	$\frac{3}{8}$ " Flange Nut w/Pin, SST	6
100365	$\frac{3}{8}$ " SAE Flat Washer, SST	4
BELOW DECK		
105327	5" Half Clamp, Specify Color	4
113729	Offset Hanger Clamp, Specify Color	4
113468	Spacer Tube, Specify Color	2
113464	Angled Panel Bracket, Specify Color	1
117329	House Panel, Specify Color	1
100610	$\frac{1}{4}$ " x $\frac{3}{8}$ " Drive Rivet, AL/SST	4
124947	Below Deck Mounting Hardware Package	1
124460	$\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/Pin, SST	2
100195	$\frac{3}{8}$ " x $\frac{5}{8}$ " BHCS w/Pin, SST	4
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST	8
100203	$\frac{5}{8}$ " x 2 $\frac{1}{4}$ " BHCS w/Pin, SST	2
100351	$\frac{3}{8}$ " Tee Nut, SST	8
100353	$\frac{3}{8}$ " Flange Nut w/Pin, SST	6

Specifications

- Permalene® Panel:** Two color panel measures 35 $\frac{5}{8}$ " wide x 41" high, color specified.
- Angled Panel Brkt:** Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6061-T6 aluminum threaded tubes 1 $\frac{1}{8}$ " O.D. x 1 $\frac{1}{2}$ " long. Finish: ProShield®, color specified.
- Spacer Tube:** Made from 6061-T6 aluminum $\frac{7}{8}$ " O.D. x 1 $\frac{11}{16}$ ". Finish: ProShield, color specified.
- Offset Hanger Clamp Assembly:** Cast aluminum. Finish: ProShield, color specified.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Above Deck Approx. $\frac{3}{4}$ man hour
Below Deck Approx. 1 man hour
- Weight:** Above Deck 40 lbs.
Below Deck 46 lbs.

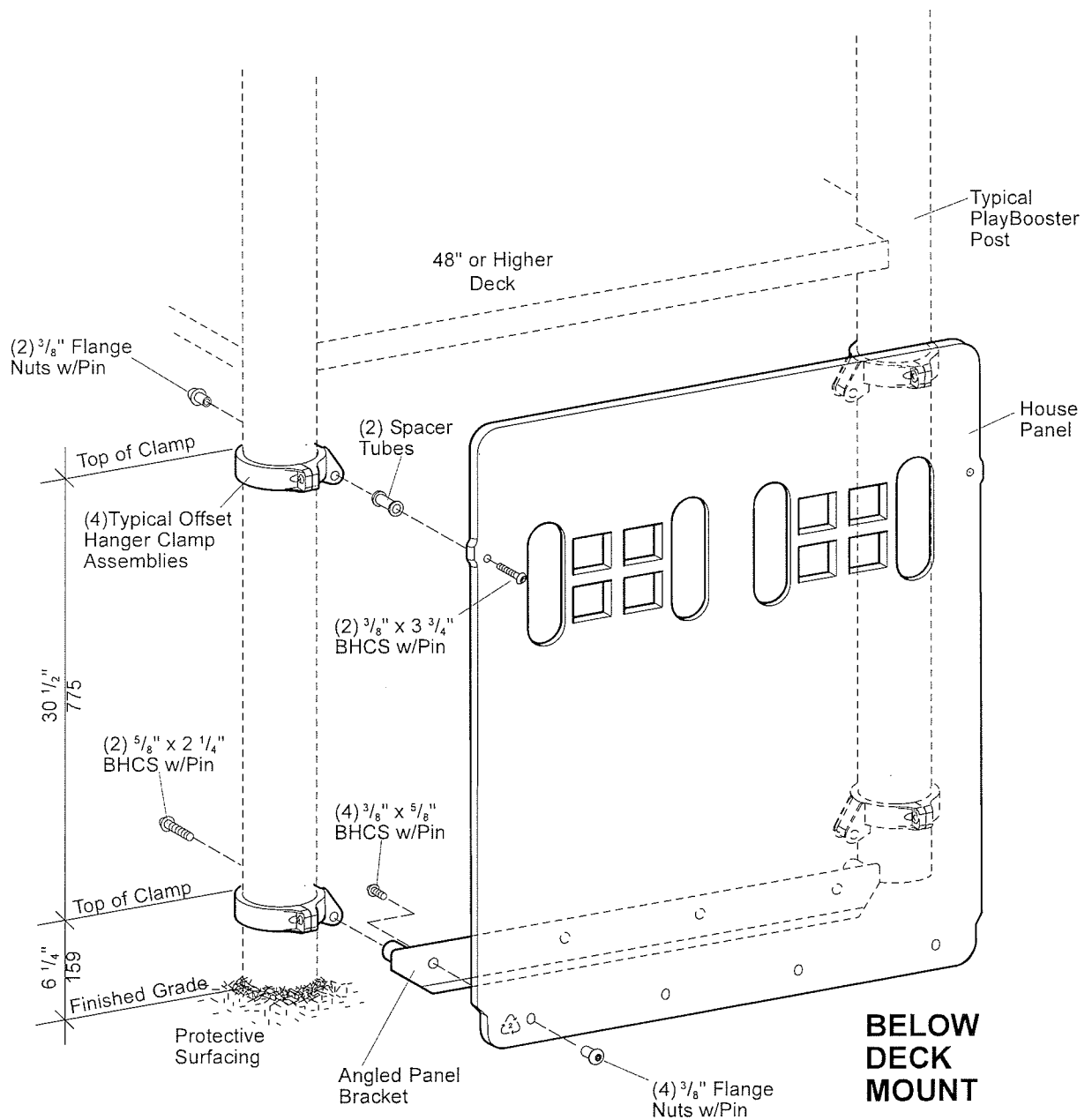
Installation Instructions

ABOVE DECK (See Sheet 1 of 2)

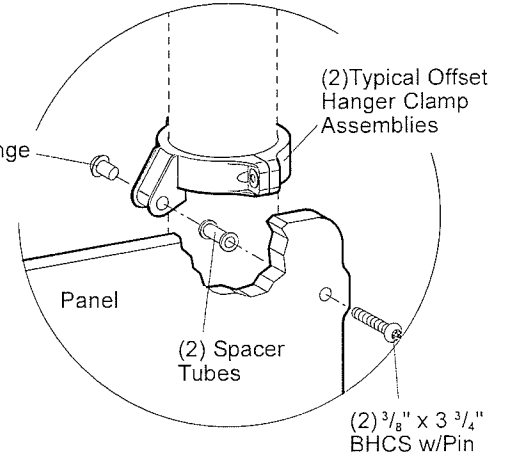
- 1) Attach panel to the face of the deck using $\frac{3}{8}$ " x $\frac{7}{8}$ " BHCSs w/pin with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " flange nuts w/pin. See Detail.
- 2) Attach offset hanger clamp assemblies to posts at height shown, using half clamps and $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 3) Attach panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/pin, spacer tubes and $\frac{3}{8}$ " flange nuts w/pin. See Panel Attachment Detail.
- 4) Install protective surfacing before users are allowed to play on the structure.

BELOW DECK (See Sheet 2 of 2)

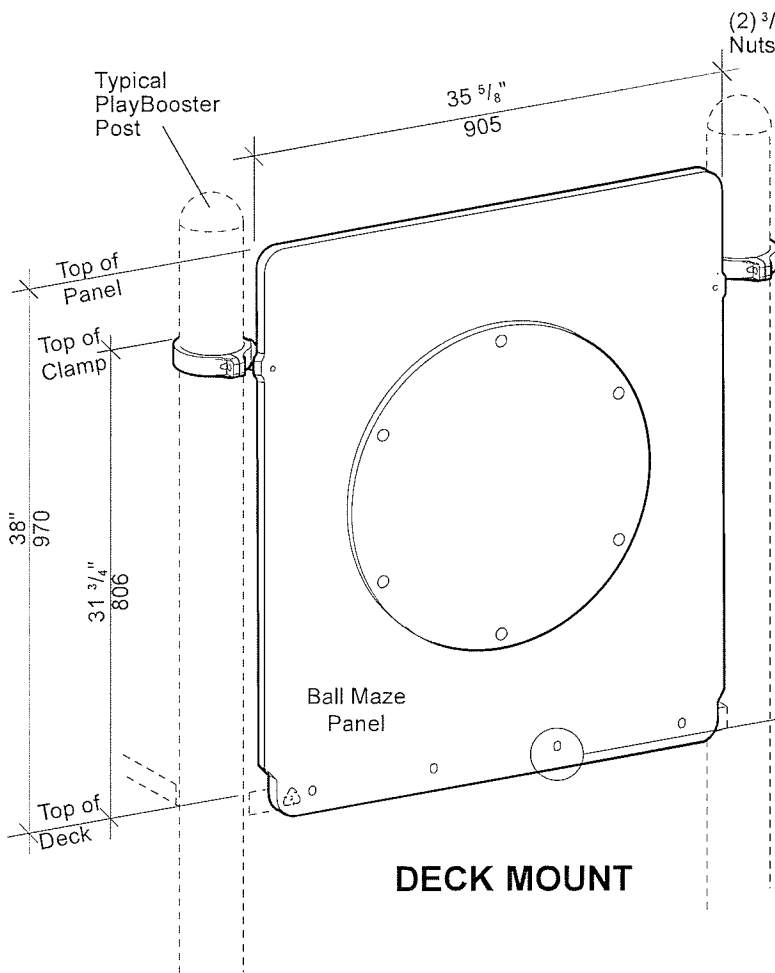
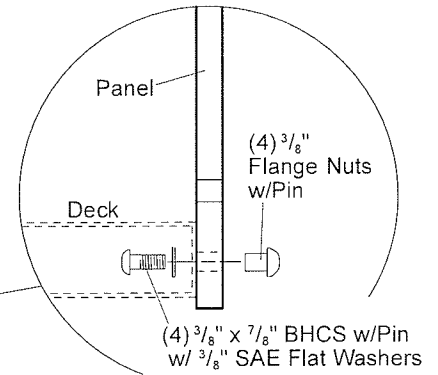
- 1) Attach offset hanger clamp assemblies to posts at height shown, using half clamps and $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach angled panel bracket to bottom of panel, using $\frac{3}{8}$ " x $\frac{5}{8}$ " BHCS w/pin and $\frac{3}{8}$ " flange nuts w/pin. See Below Deck Mount.
- 3) Attach angled panel bracket with panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 2 $\frac{1}{4}$ " BHCS w/pin. See Below Deck Mount.
- 4) Attach top of panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/pin, spacer tubes and $\frac{3}{8}$ " flange nuts w/pin. See Below Deck Mount.
- 5) Install $\frac{1}{4}$ " x $\frac{5}{8}$ " drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 6) Install protective surfacing before users are allowed to play on the structure.



**DETAIL
PANEL ATTACHMENT**



**DETAIL
TENDERDECKS**



NOTE:
 The Ball Maze Panel is preassembled at the factory.



PlayBooster® 115236 Ball Maze Panel

Parts List

Part#	Description	Qty.
ABOVE DECK		
105327	5" Half Clamp, Specify Color	2
113729	Offset Hanger Clamp, Specify Color	2
113468	Spacer Tube, Specify Color	2
133219	Ball Maze Panel Assy., Specify Color	1
124900	Tenderdeck Mounting Hardware Package	1
124460	$\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/Pin, SST	2
100196	$\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/Pin, SST	4
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST	4
100351	$\frac{3}{8}$ " Tee Nut, SST	4
100353	$\frac{3}{8}$ " Flange Nut w/Pin, SST	6
100365	$\frac{3}{8}$ " SAE Flat Washer, SST	4
BELOW DECK		
105327	5" Half Clamp, Specify Color	4
113729	Offset Hanger Clamp, Specify Color	4
113468	Spacer Tube, Specify Color	2
113464	Angled Panel Bracket, Specify Color	1
133219	Ball Maze Panel Assy., Specify Color	1
124947	Below Deck Mounting Hardware Package	1
124460	$\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/Pin, SST	2
100195	$\frac{3}{8}$ " x $\frac{3}{8}$ " BHCS w/Pin, SST	4
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST	8
100203	$\frac{3}{8}$ " x 2 $\frac{1}{4}$ " BHCS w/Pin, SST	2
100351	$\frac{3}{8}$ " Tee Nut, SST	8
100353	$\frac{3}{8}$ " Flange Nut w/Pin, SST	6
100610	$\frac{1}{4}$ " x $\frac{5}{8}$ " Drive Rivet, AL/SST	4

Specifications

- Permalene® Panel:** Two color panel measures 35 $\frac{3}{8}$ " wide x 41" high, color specified.
- Cover:** Made from .177" thick x 18 $\frac{5}{16}$ " diameter clear polycarbonate.
- Ball:** $\frac{1}{2}$ " Diameter, stainless steel.
- Angled Panel Brkt:** Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6061-T6 aluminum threaded tubes 1 $\frac{1}{8}$ " O.D. x 1 $\frac{1}{2}$ " long. Finish: ProShield®, color specified.
- Spacer Tube:** Made from 6061-T6 aluminum $\frac{7}{8}$ " O.D. x 1 $\frac{11}{16}$ ". Finish: ProShield, color specified.
- Offset Hanger Clamp Assembly:** Cast aluminum. Finish: ProShield, color specified.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Above Deck Approx. $\frac{3}{4}$ man hour
Below Deck Approx. 1 man hour
- Weight:** Above Deck 65 lbs.
Below Deck 73 lbs.

Installation Instructions

ABOVE DECK (See Sheet 1 of 2)

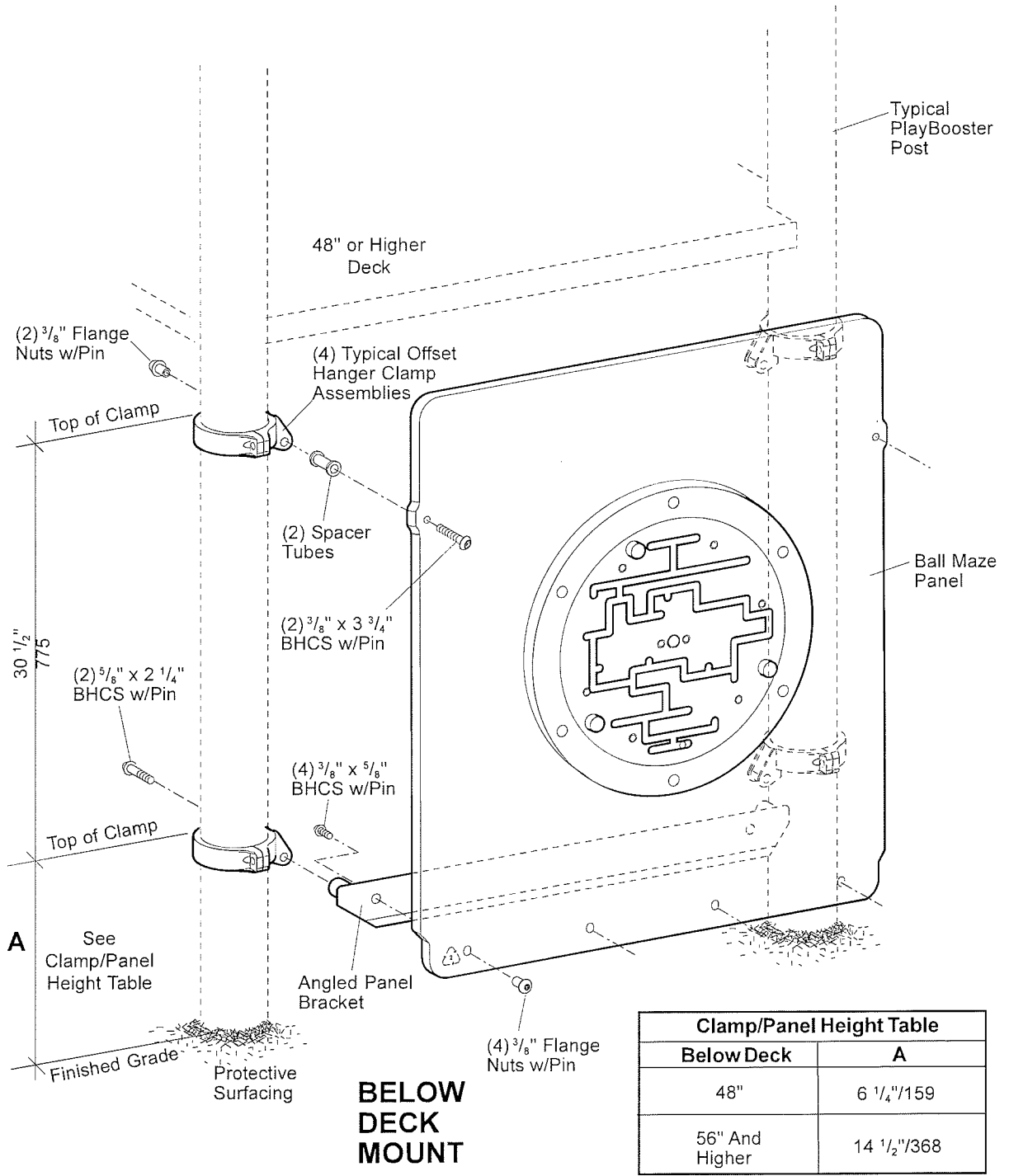
- 1) Attach panel to the face of the deck, using $\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/pin with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " flange nuts w/pin. See Detail.
- 2) Attach offset hanger clamp assemblies to posts at height shown, using 5" half clamps and $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 3) Attach panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/pin, spacer tubes and $\frac{3}{8}$ " flange nuts w/pin. See Panel Attachment Detail.
- 4) Install protective surfacing before users are allowed to play on the structure.

BELOW DECK (See Sheet 2 of 2)

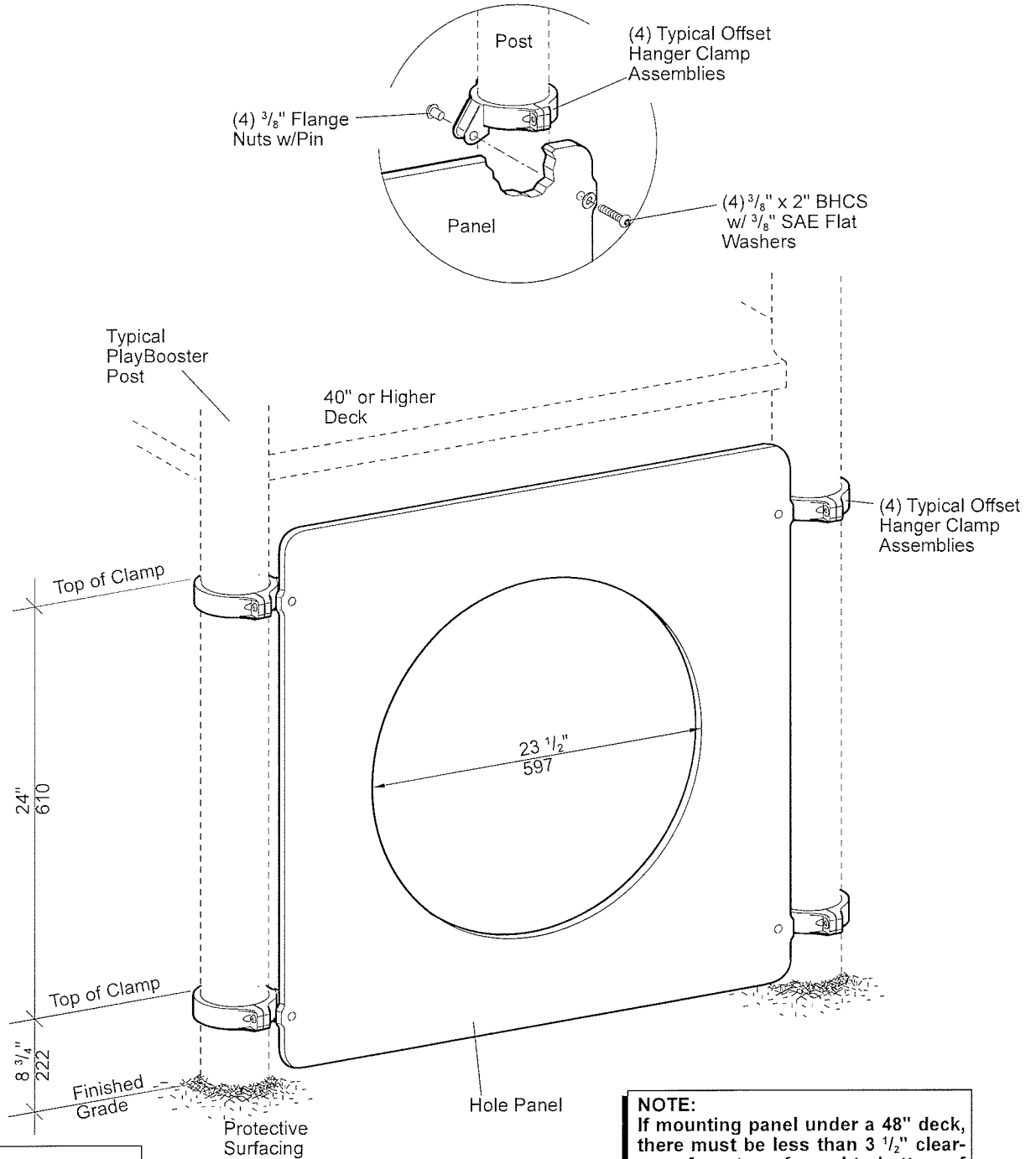
- 1) Attach offset hanger clamp assemblies to posts at height shown, using 5" half clamps and $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach angled panel bracket to bottom of panel, using $\frac{3}{8}$ " x $\frac{5}{8}$ " BHCS w/pin and $\frac{3}{8}$ " flange nuts w/pin. See Panel Attachment Detail.
- 3) Attach angled panel bracket with panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 2 $\frac{1}{4}$ " BHCS w/pin. See Below Deck Mount.
- 4) Attach top of panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 3 $\frac{3}{4}$ " BHCS w/pin, spacer tubes and $\frac{3}{8}$ " flange nuts w/pin. See Typical Attachment To Post Detail.
- 5) Install $\frac{1}{4}$ " x $\frac{5}{8}$ " drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 6) Install protective surfacing before users are allowed to play on the structure.

Specifications are subject to change without notice.

Eco #51010 Document #13757600 replaces #13412600. Added color combinations for permalene panels. 1/13/10 Removed color combinations block.



**DETAIL
PANEL ATTACHMENT**



NOTE:
This Panel is used at ground level only, under 40" or higher decks.

NOTE:
If mounting panel under a 48" deck, there must be less than 3 1/2" clearance from top of panel to bottom of deck.

PlayBooster®

115253 Hole Panel

601 7TH STREET SOUTH, DELANO, MINNESOTA 55328-8605 888-574-4678 LSI Install Help 888-438-6574 LSI Direct 763-972-5200 Int. FAX (763) 972-3185
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Document #13374600



PlayBooster® 115253 Hole Panel

Parts List

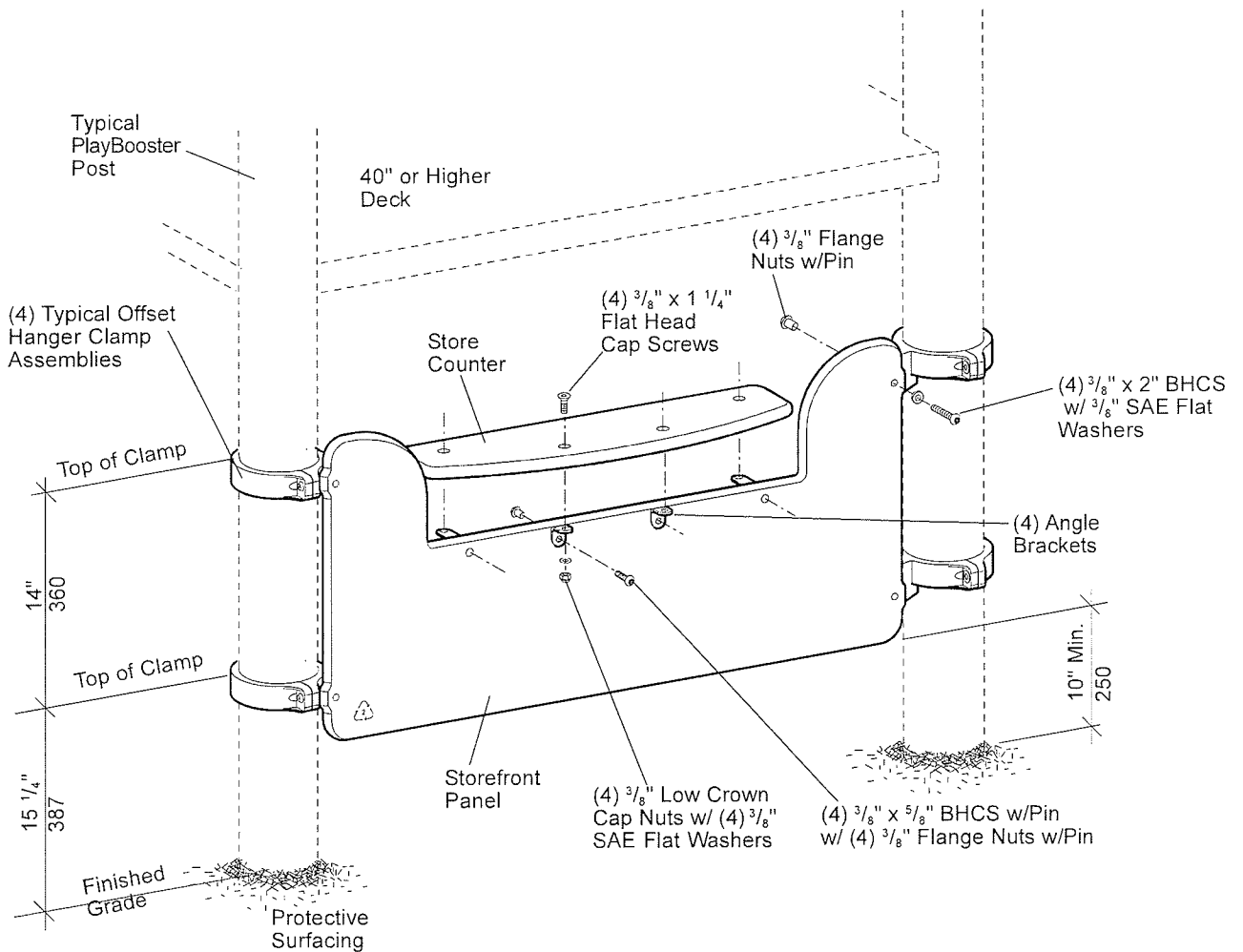
Part#	Description	Qty.
105327	5" Half Clamp, Specify Color	4
113729	Offset Hanger Clamp, Specify Color	4
133459	Hole Panel, Specify Color	1
133444	Panel Attachment Hardware Package	1
100173	$\frac{3}{8}$ " x 2" BHCS, SST	4
100198	$\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/Pin, SST	8
100351	$\frac{3}{8}$ " Tee Nut, SST	8
100353	$\frac{3}{8}$ " Flange Nut w/Pin, SST	4
100610	$\frac{1}{4}$ " x $\frac{3}{8}$ " Drive Rivet, AL/SST	4
100365	$\frac{3}{8}$ " SAE Flat Washer, SST	4

Specifications

Hole Panel:	Permalene® solid color. Panel measures 35 $\frac{5}{8}$ " wide x 37" high, color specified.
Offset Hanger Clamp Assembly:	Cast aluminum. Finish: ProShield®, color specified.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
Installation Time:	Approx. 1 man hour
Weight:	34 lbs.

Installation Instructions

- 1) Attach offset hanger clamp assemblies to posts at height shown, using half clamps and $\frac{3}{8}$ " x 1 $\frac{1}{8}$ " BHCS w/pin with $\frac{3}{8}$ " tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach panel to offset hanger clamp assemblies, using $\frac{3}{8}$ " x 2" BHCS with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " flange nuts w/pin. See Panel Attachment Detail.
- 3) Install $\frac{1}{4}$ " x $\frac{5}{8}$ " drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 4) Install protective surfacing before users are allowed to play on the structure.



NOTE:
 This Panel is used at ground level only, under 40" or higher decks.



PlayBooster® 115254 Storefront Panel

Parts List

Part#	Description	Qty.
105327	5" Half Clamp, Specify Color	4
113729	Offset Hanger Clamp, Specify Color	4
144581	Storefront Panel, Specify Color	1
144580	Store Counter, Specify Color	1
133444	Panel Attachment Hardware Package	1
100173	3/8" x 2" BHCS, SST	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST	8
100351	3/8" Tee Nut, SST	8
100353	3/8" Flange Nut w/Pin, SST	4
100610	1/4" x 5/8" Drive Rivet, AL/SST	4
100365	3/8" SAE Flat Washer, SST	4
188683	Store Counter Top Hardware Package	1
100195	3/8" x 5/8" BHCS w/Pin, SST	4
100252	3/8" x 1 1/4" Flat Head Cap Screw, SST	4
100349	3/8" Low Crown Cap Nut, SST	4
100353	3/8" Flange Nut w/Pin, SST	4
100365	3/8" SAE Flat Washer, SST	4
188664	Steel Angle Bracket, Silver	4

Specifications

Storefront Panel: Permalene® solid color. Panel measures 35 5/8" wide x 20" high, color specified.

Offset Hanger Clamp Assembly: Cast aluminum. Finish: ProShield®, color specified.

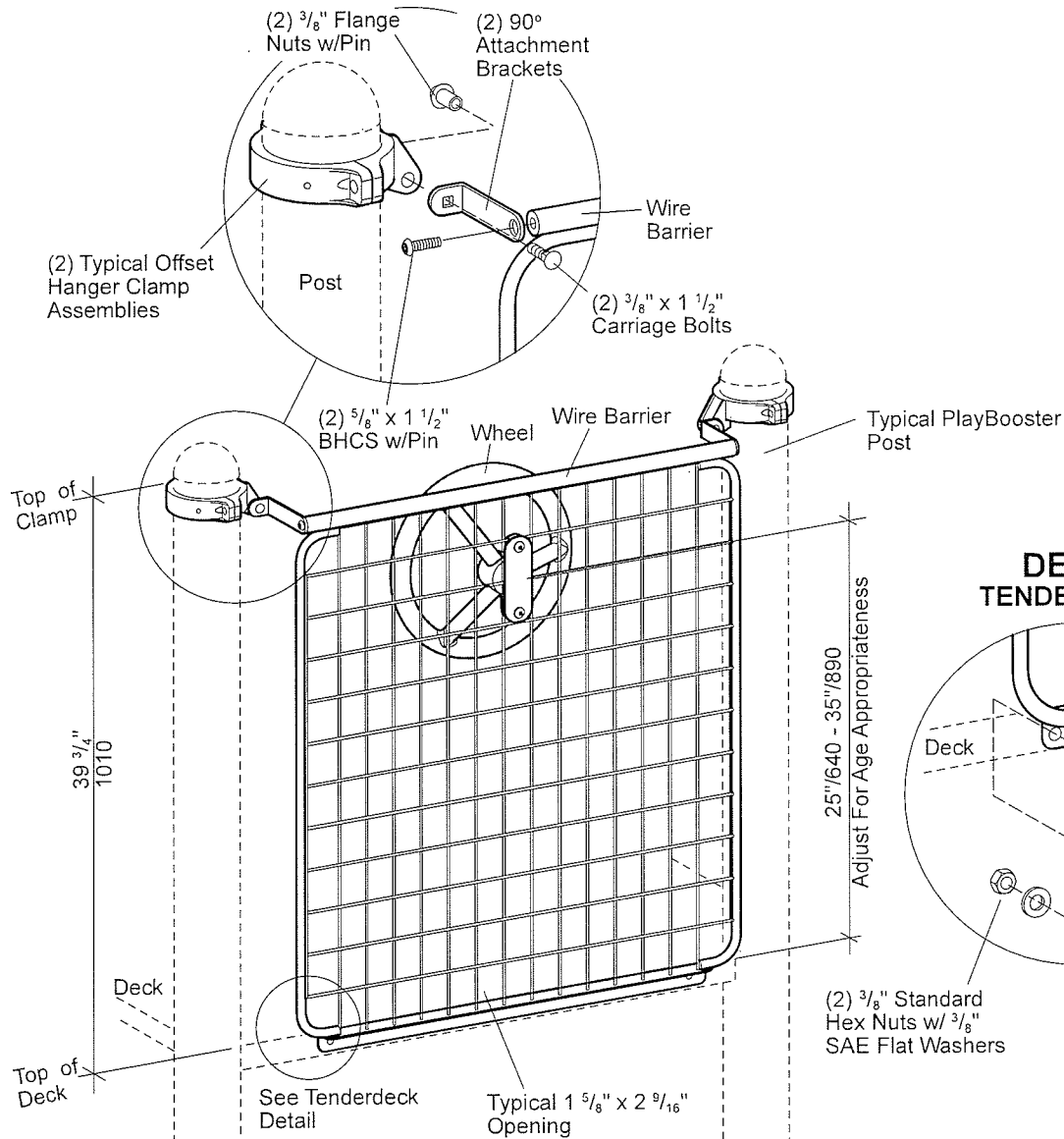
Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: Approx. 1 man hour
Weight: 29 lbs.

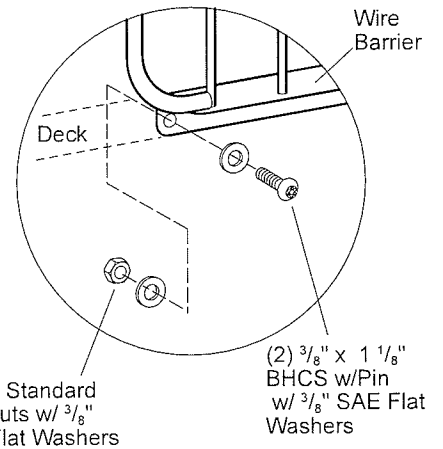
Installation Instructions

- 1) Attach offset hanger clamp assemblies to posts at height shown, using half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach panel to offset hanger clamp assemblies, using 3/8" x 2" BHCS with 3/8" SAE flat washers and 3/8" flange nuts w/pin.
- 3) Attach angle brackets to storefront panel using 3/8" x 5/8" BHCS w/pin through angles and 3/8" flange nuts w/pin through panel. Attach store counter top to angle brackets using 3/8" x 1 1/4" flat head cap screws through counter top and 3/8" low crown cap nuts with 3/8" SAE flat washers underneath angles.
- 4) Install 1/4" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 5) Install protective surfacing before users are allowed to play on the structure.

**DETAIL
90° ATTACHMENT BRACKETS**

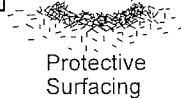


**DETAIL
TENDERDECKS**



NOTE: Steering Wheel Infill Panel available. Refer to the Wheel Spec Sheet.

DECK MOUNT





PlayBooster® 120314 Wire Barrier, w/Wheel

Parts List

Part#	Description	Qty.
ABOVE DECK		
132760	Wire Barrier, Specify Color.....	1
108432	Wheel, Specify Color.....	1
128824	90° Attachment Bracket, Specify Color.....	2
127242	Steering Wheel Bracket, Specify Color.....	1
222309	Wire Bracket, Black.....	1
105327	5" Half Clamp, Specify Color.....	2
113729	Offset Hanger Clamp, Specify Color.....	2
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	2
132739	Barrier, Above Deck Hardware Package	1
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	6
100201	5/8" x 1 1/2" BHCS w/Pin, SST.....	2
100351	3/8" Tee Nut, SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	2
116017	3/8" x 1 1/2" Carriage Bolt w/Patch, SST.....	2
100327	3/8" Standard Hex Nut, SST.....	2
100365	3/8" SAE Flat Washer, SST.....	4
240354	Wire/Pipe Barrier Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	2
100353	3/8" Flange Nut w/Pin, SST.....	2
237528	3/16" x 7/8" Spring Pin, SST.....	1
234353	Cap, White.....	1
100365	3/8" SAE Flat Washer, SST.....	2
BELOW DECK		
132760	Wire Barrier, Specify Color.....	1
108432	Wheel, Specify Color.....	1
128824	90° Attachment Bracket, Specify Color.....	2
127242	Steering Wheel Bracket, Specify Color.....	1
222309	Wire Bracket, Black.....	1
105327	5" Half Clamp, Specify Color.....	4
113729	Offset Hanger Clamp, Specify Color.....	4
113464	Angled Panel Bracket, Specify Color.....	1
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	4
240354	Wire/Pipe Barrier Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	2
100353	3/8" Flange Nut w/Pin, SST.....	2
237528	3/16" x 7/8" Spring Pin, SST.....	1
234353	Cap, White.....	1
100365	3/8" SAE Flat Washer, SST.....	2
132741	Barrier, Below Deck Hardware Package	1
116017	3/8" x 1 1/2" Carriage Bolt, SST.....	2
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	8
100196	3/8" x 7/8" BHCS w/Pin, SST.....	2
100203	5/8" x 2 1/4" BHCS w/Pin, SST.....	2
100351	3/8" Tee Nut, SST.....	8
100201	5/8" x 1 1/2" BHCS w/Pin, SST.....	2
100327	3/8" Standard Hex Nut, SST.....	2
100365	3/8" SAE Flat Washer, SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	2

Specifications

- Barrier:** Weldment comprised of 5/8" solid steel vertical rails, 1 1/8" O.D. steel horizontal rails with 203 or 303 stainless steel welded inserts with 5/8" internal threads, 1 1/2" x 1 1/2" x 29 1/2" angle iron and 1/4" diameter wire. Barrier has approximately 1 3/8" x 2 3/16" openings and measures 33 7/8" wide x 39 13/16" high. Finish: TenderTuff™, color specified.
- Wheel:** 12" diameter cast A356 aluminum alloy. Finish: TenderTuff, color specified.
- Wheel Bracket:** Weldment comprised of formed 3/16" plate and 5/8" O.D. stainless steel shaft. Finish: ProShield®, color specified.

Specifications are subject to change without notice.

- Wire Bracket:** 3/16" (4,74 mm) Thick HRPO flat steel. Finish: ProShield®, black in color.
- Angled Panel Brkt.:** Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6005-T5 aluminum threaded tubes 1 1/8" O.D. x 1 1/2" long. Finish: ProShield, color specified.
- 90° Bracket:** Formed from 1/4" x 1 1/4" HRPO flat steel. Finish: ProShield, color specified.
- Offset Hanger Clamp Assembly:** Cast aluminum. Finish: ProShield, color specified.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Approx. 1 1/4 man hours
- Weight:** Above Deck 38 lbs.
Below Deck 44 lbs.

Installation Instructions

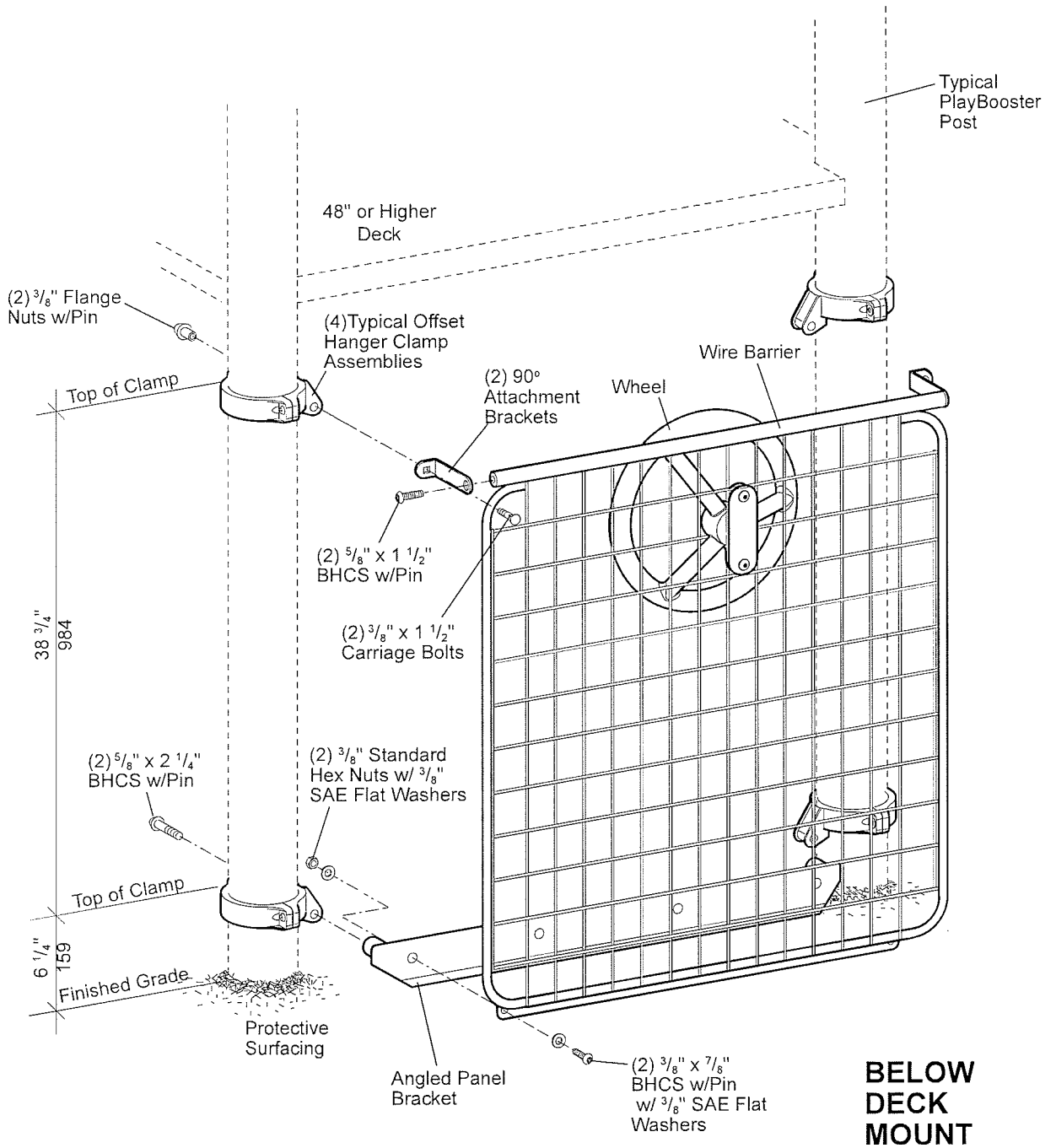
ABOVE DECK (See Sheet 1 of 2)

- Attach the wire barrier to the face of the deck. Refer to the Tenderdeck Detail.
- Attach the offset hanger clamp assemblies to the posts, using 5" half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- Attach the 90° attachment brackets to wire barrier. Refer To The 90° Attachment Bracket Detail.
- Attach the 90° attachment brackets to the offset hanger clamps. Refer To The 90° Attachment Bracket Detail.
- Attach wheel bracket and wire bracket to barrier in desired position. Slide wheel and cap onto wheel bracket shaft and tap 3/16" x 7/8" spring pin through cap and shaft. Refer To The Wheel Assembly Details.
- Install protective surfacing before users are allowed to play on the structure.

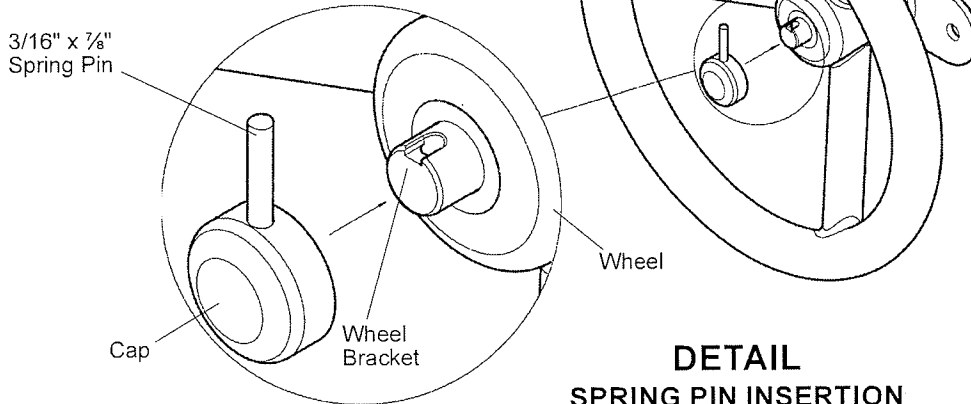
BELOW DECK (See Sheet 2 of 2)

- Attach offset hanger assemblies to posts at height shown, using 5" half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- Attach angled panel bracket to bottom of wire barrier. See Below Deck Mount.
- Attach angled panel bracket with wire barrier to offset hanger clamp assemblies. See Below Deck Mount.
- Attach the 90° attachment brackets to wire barrier. Refer To The 90° Attachment Bracket Detail.
- Attach the 90° attachment brackets to the offset hanger clamps. Refer To The 90° Attachment Bracket Detail.
- Attach wheel bracket and wire bracket to barrier in desired position. Slide wheel and cap onto wheel bracket shaft and tap 3/16" x 7/8" spring pin through cap and shaft. Refer To The Wheel Assembly Details.
- Install 1/4" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec sheet.
- Install protective surfacing before users are allowed to play on the structure.

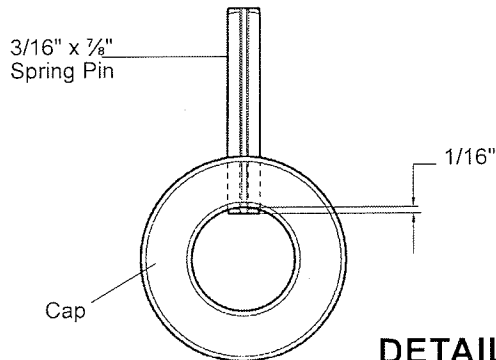
Eco #0101223 Document #24035600 replaces #22268600. Replaced cap and spring pin.



**DETAIL
WHEEL ASSEMBLY**

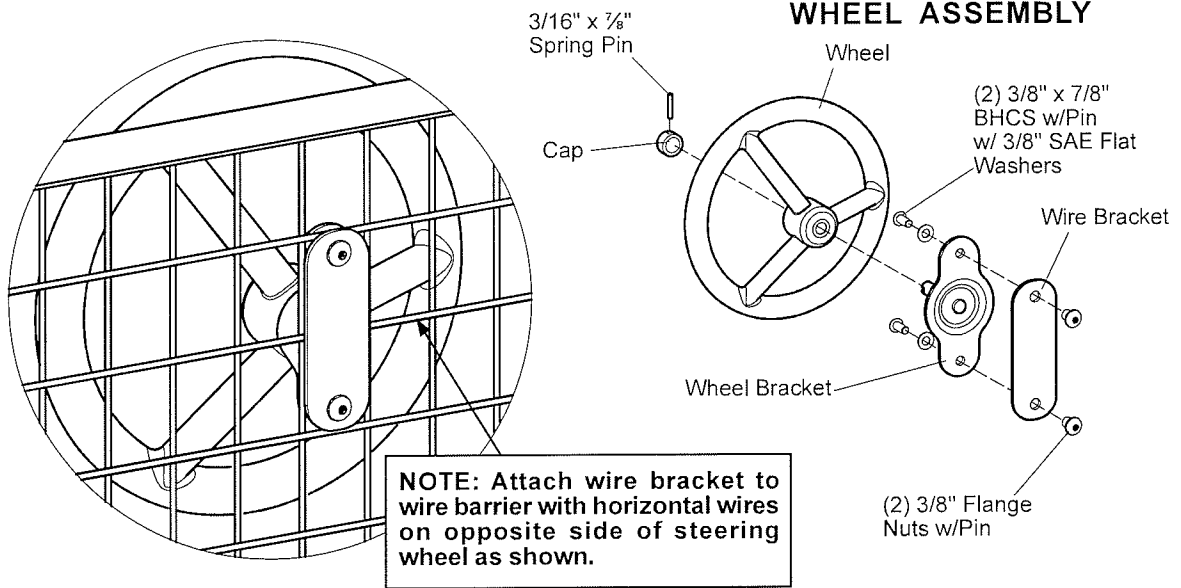


**DETAIL
SPRING PIN INSERTION
(CAP BACK VIEW)**



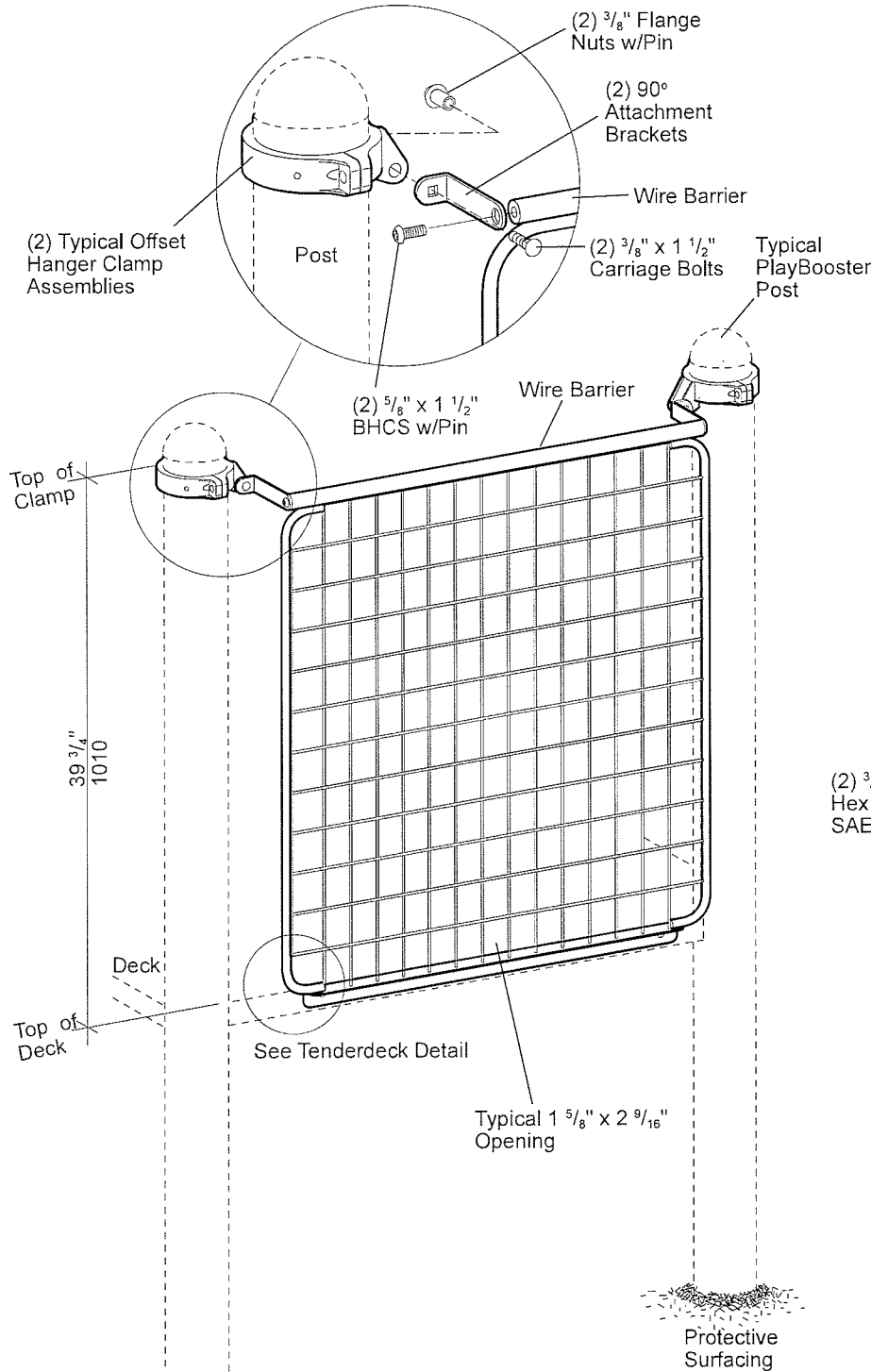
NOTE: To assist in the alignment of the cap to the wheel bracket shaft, tap spring pin through cap approximately 1/16". Orient spring pin to groove on wheel bracket shaft. Slide cap in place and tap spring pin through cap and shaft until flush.

**DETAIL
WHEEL ASSEMBLY**

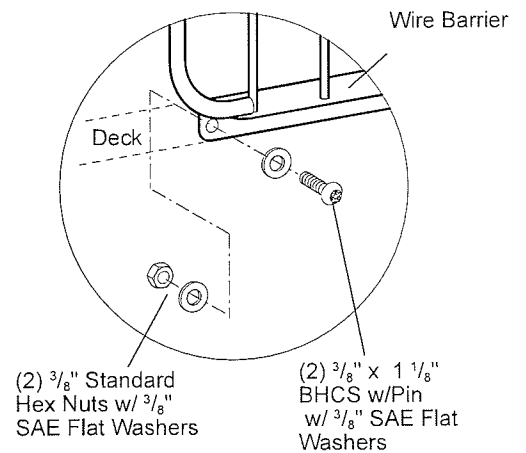


NOTE: Attach wire bracket to wire barrier with horizontal wires on opposite side of steering wheel as shown.

**DETAIL
90° ATTACHMENT BRACKETS**



**DETAIL
TENDERDECKS**



DECK MOUNT



PlayBooster® 120314 Wire Barrier

Parts List

Part#	Description	Qty.
ABOVE DECK		
132760	Wire Barrier, Specify Color.....	1
128824	90° Attachment Bracket, Specify Color.....	2
105327	5" Half Clamp, Specify Color.....	2
113729	Offset Hanger Clamp, Specify Color.....	2
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	2
132739	Barrier, Above Deck Hardware Package	1
100198	3/8" x 1 1/8" BHCS w/Pin, SST	6
100201	5/8" x 1 1/2" BHCS w/Pin, SST	2
100351	3/8" Tee Nut, SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	2
116017	3/8" x 1 1/2" Carriage Bolt w/Patch, SST.....	2
100327	3/8" Standard Hex Nut, SST.....	2
100365	3/8" SAE Flat Washer, SST.....	4
BELOW DECK		
132760	Wire Barrier, Specify Color.....	1
128824	90° Attachment Bracket, Specify Color.....	2
105327	5" Half Clamp, Specify Color.....	4
113729	Offset Hanger Clamp, Specify Color.....	4
113464	Angled Panel Bracket, Specify Color.....	1
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	4
132741	Barrier, Below Deck Hardware Package	1
116017	3/8" x 1 1/2" Carriage Bolt, SST	2
100198	3/8" x 1 1/8" BHCS w/Pin, SST	8
100196	3/8" x 2 1/8" BHCS w/Pin, SST	2
100203	3/8" x 2 1/4" BHCS w/Pin, SST	2
100351	3/8" Tee Nut, SST.....	8
100201	5/8" x 1 1/2" BHCS w/Pin, SST	2
100327	3/8" Standard Hex Nut, SST.....	2
100365	3/8" SAE Flat Washer, SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	2

Specifications

- Barrier:** Weldment comprised of 5/8" solid steel vertical rails, 1 1/8" O.D. steel horizontal rails with 203 or 303 stainless steel welded inserts with 5/8" internal threads, 1 1/2" x 1 1/2" x 29 1/2" angle iron and 1/4" diameter wire. Barrier has approximately 1 5/8" x 2 9/16" openings and measures 33 7/8" wide x 39 13/16" high. Finish: TenderTuff™, color specified.
- 90° Bracket:** Formed from 1/4" x 1 1/4" HRPO flat steel. Finish: ProShield®, color specified.
- Angled Panel Brkt.:** Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6005-T5 aluminum threaded tubes 1 1/8" O.D. x 1 1/2" long. Finish: ProShield, color specified.
- Offset Hanger Clamp Assembly:** Cast aluminum. Finish: ProShield, color specified.
- Fasteners:** Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
- Installation Time:** Approx. 1 1/4 man hours
- Weight:** Above Deck 33 lbs.
Below Deck 39 lbs.

Installation Instructions

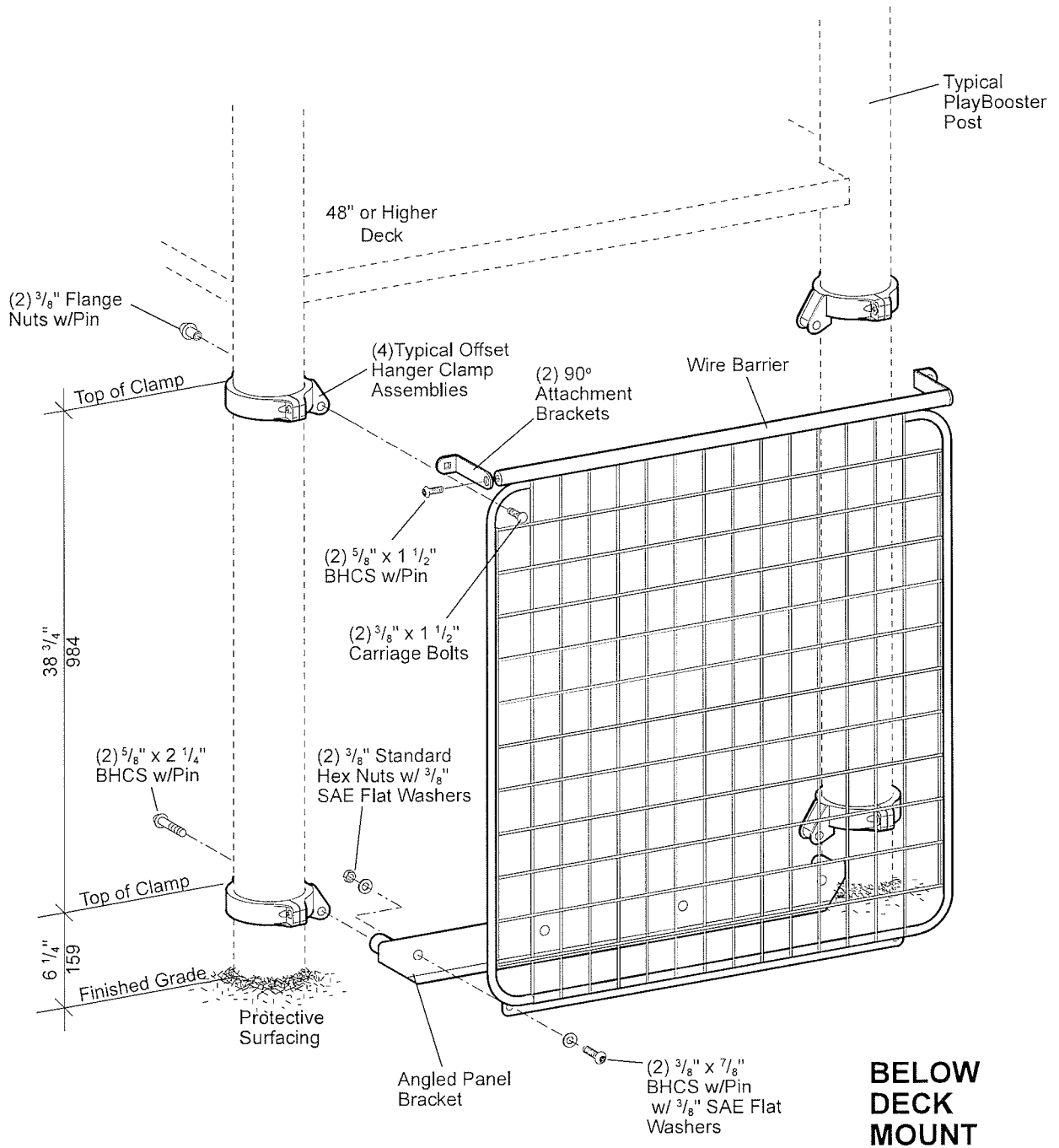
ABOVE DECK (See Sheet 1 of 2)

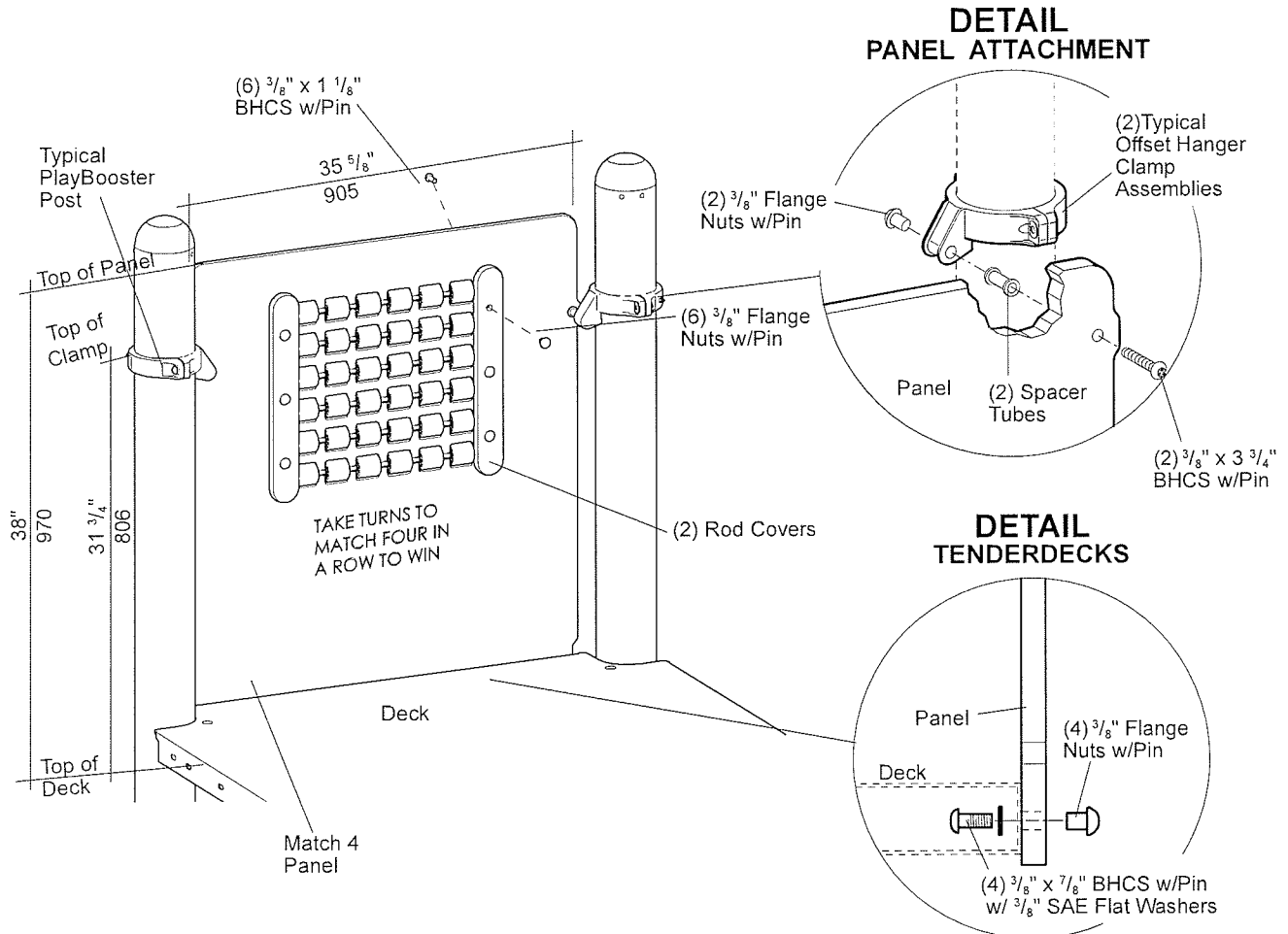
- 1) Attach the wire barrier to the face of the deck, using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to the Tenderdeck Detail.
- 2) Attach the offset hanger clamp assemblies to the posts, using 5" half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 3) Attach the 90° attachment brackets to wire barrier using 5/8" x 1 1/2" BHCS w/pin. Refer To The 90° Attachment Bracket Detail.
- 4) Attach the 90° attachment brackets to the offset hanger clamps, using 3/8" x 1 1/2" carriage bolts and 3/8" flange nuts w/pin. Refer To The 90° Attachment Bracket Detail.
- 5) Install protective surfacing before users are allowed to play on the structure.

BELOW DECK (See Sheet 2 of 2)

- 1) Attach offset hanger assemblies to posts at height shown, using 5" half clamps and 3/8" x 1 1/8" BHCS w/pin with 3/8" tee nuts. Refer To The Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach angled panel bracket to bottom of wire barrier, using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers. See Below Deck Mount.
- 3) Attach angled panel bracket with wire barrier to offset hanger clamp assemblies, using 5/8" x 2 1/4" BHCS w/pin. See Below Deck Mount.
- 4) Attach the 90° attachment brackets to wire barrier using 5/8" x 1 1/2" BHCS w/pin. Refer To The 90° Attachment Bracket Detail.
- 5) Attach the 90° attachment brackets to the offset hanger clamps using 3/8" x 1 1/2" carriage bolts and 3/8" flange nuts w/pin. Refer To The 90° Attachment Bracket Detail.
- 6) Install 1/4" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec sheet.
- 7) Install protective surfacing before users are allowed to play on the structure.

6-G-01 Document #13517900 Replaces #13166000. Removed 2 mounting holes from wire barrier and also changed wire diameter for wire barrier to 1/4".



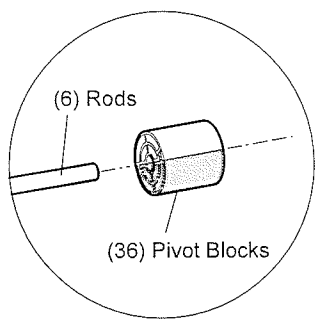


**DETAIL
PANEL ATTACHMENT**

**DETAIL
TENDERDECKS**

**DETAIL
PIVOT BLOCK ASSEMBLY**

**DECK
MOUNT**



NOTE: Deck mount panel needs to have panel facing inside the deck, allowing user to read the panel from where they are located..



PlayBooster® 127678 Match 4 Panel

Parts List

Part#	Description	Qty.
ABOVE DECK		
121742	Match 4 Panel, Specify Color.....	1
136752	Pivot Block Set.....	1
121743	18 3/16" Rod, SST.....	6
121806	Rod Cover, Specify Color.....	2
105327	5" Half Clamp, Specify Color.....	2
113729	Offset Hanger Clamp, Specify Color.....	2
113468	Spacer Tube, Specify Color.....	2
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	2
124900	Tenderdeck Mounting Hardware Package	1
124460	3/8" x 3 3/4" BHCS w/Pin, SST.....	2
100196	3/8" x 7/8" BHCS w/Pin, SST.....	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	4
100351	3/8" Tee Nut, SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	6
100365	3/8" SAE Flat Washer, SST.....	4
122034	Match 4 Hardware Package	1
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	6
100353	3/8" Flange Nut w/Pin, SST.....	6
BELOW DECK		
121742	Match 4 Panel, Specify Color.....	1
113464	Angled Panel Bracket, Specify Color.....	1
136752	Pivot Block Set.....	1
121743	18 3/16" Rod, SST.....	6
121806	Rod Cover, Specify Color.....	2
105327	5" Half Clamp, Specify Color.....	4
113729	Offset Hanger Clamp, Specify Color.....	4
113468	Spacer Tube, Specify Color.....	2
100610	1/4" x 5/8" Drive Rivet, AL/SST.....	4
124947	Ground Level Mounting Hardware Package	1
124460	3/8" x 3 3/4" BHCS w/Pin, SST.....	2
100195	3/8" x 3/8" BHCS w/Pin, SST.....	4
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	8
100203	3/8" x 2 1/4" BHCS w/Pin, SST.....	2
100351	3/8" Tee Nut, SST.....	8
100353	3/8" Flange Nut w/Pin, SST.....	6
122034	Match 4 Hardware Package	1
100198	3/8" x 1 1/8" Hex-Pin Cap Screw, SST.....	6
100353	3/8" Flange Nut w/Pin, SST.....	6

Specifications

Permalene® Panel:	Two color panel measures 35 3/8" wide x 41" high, color specified.
Pivot Blocks:	U.V. stabilized high-density polyethylene, tan on one side and brown on the other.
Rod Cover:	Solid color Permalene, color specified.
Angled Panel Brkt:	Weldment comprised of .190" thick 5052 aluminum formed angle with (2) 6061-T6 aluminum threaded tubes 1 1/8" O.D. x 1 1/2" long. Finish: ProShield®, color specified.
Spacer Tube:	Made from 6061-T6 aluminum 7/8" O.D. x 1 11/16". Finish: ProShield, color specified.
Rod:	1/2" x 18 3/16" stainless steel.
Offset Hanger Clamp Assembly:	Cast aluminum. Finish: ProShield, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: Above Deck Approx. 1 man hour
Below Deck Approx. 1 1/4 man hours

Weight: Above Deck - 46 lbs.
Below Deck - 52 lbs.

Installation Instructions

ABOVE DECK (See Sheet 1 of 2)

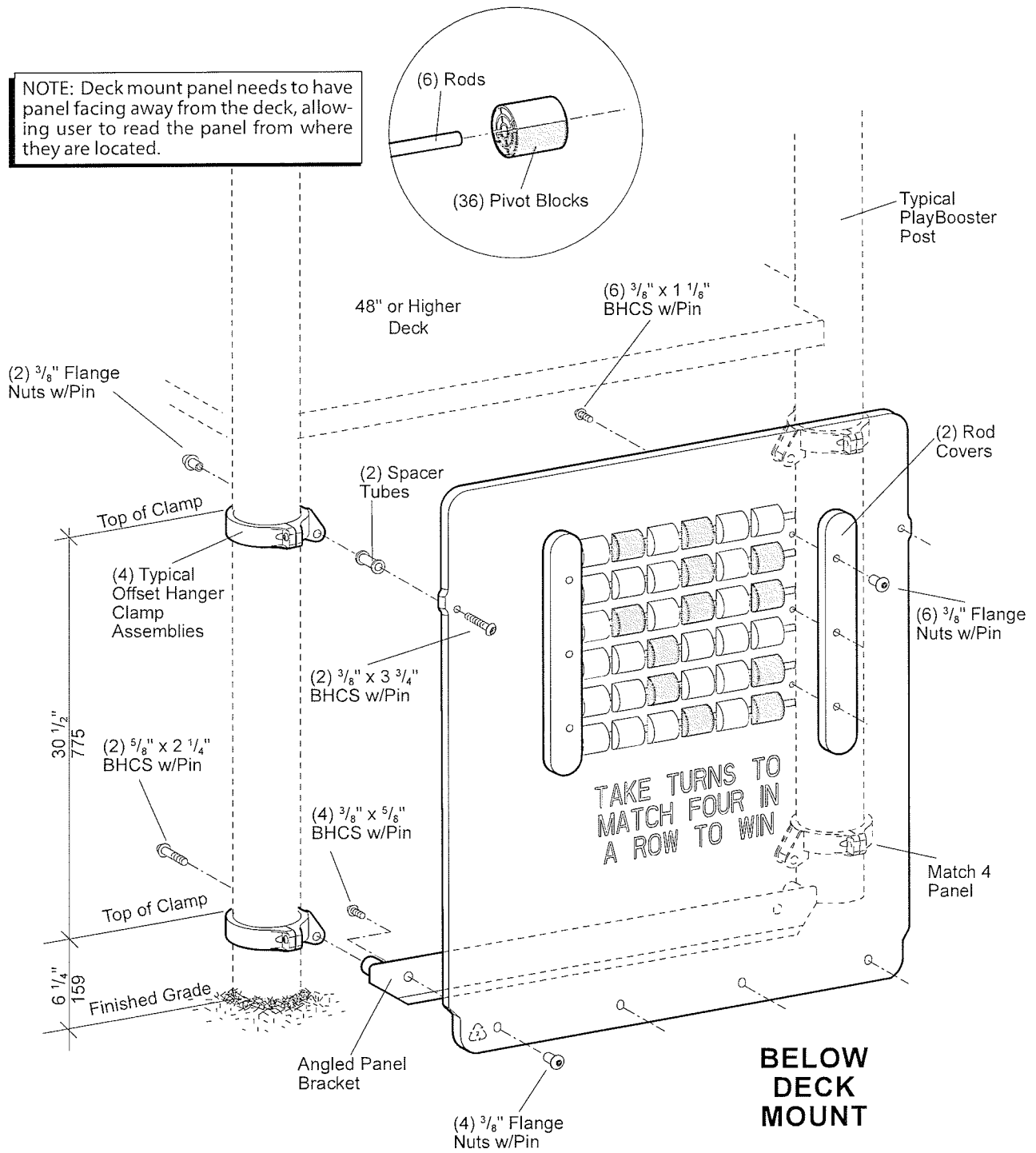
- 1) Attach panel to the face of the deck using 3/8" x 7/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" flange nuts w/pin. Refer to the Tenderdeck Detail.
- 2) Attach offset hanger clamp assemblies to posts at height shown, using 5" half clamps, 3/8" x 1 1/8" BHCS w/pin and 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 3) Attach panel to offset hanger clamp assemblies, using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. See Panel Attachment Detail.
- 4) Place (6) pivot blocks on each of the 18 3/16" rods and tap rods into cut out grooves on panel using a plastic or rubber hammer. Continue this process until all (6) rods are in place. Refer to the Pivot Block Assembly Detail.
- 5) Attach the rod covers using 3/8" x 1 1/8" BHCS w/pin and 3/8" flange nuts w/pin.
- 6) Install protective surfacing before users are allowed to play on the structure.

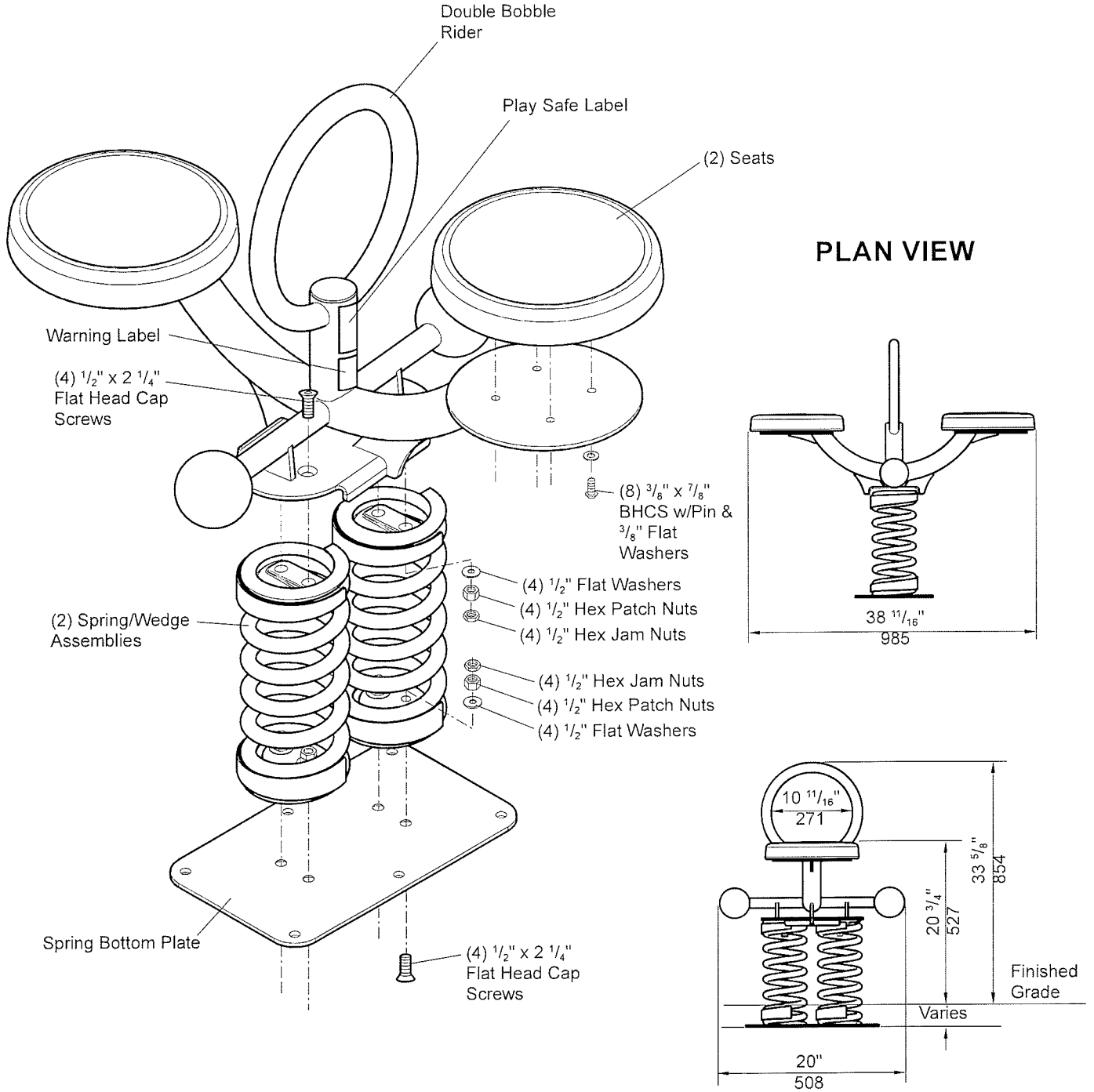
BELOW DECK (See Sheet 2 of 2)

- 1) Attach offset hanger clamp assemblies to posts at height shown, using 5" half clamps, 3/8" x 1 1/8" BHCS w/pin and 3/8" tee nuts. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 2) Attach angled panel bracket to bottom of panel using 3/8" x 5/8" BHCS w/pin and 3/8" flange nuts w/pin. See Below Deck Mount.
- 3) Attach angled panel bracket with panel to offset hanger clamp assemblies using 3/8" x 2 1/4" BHCS w/pin. See Below Deck Mount.
- 4) Attach top of panels to offset hanger clamp assemblies using 3/8" x 3 3/4" BHCS w/pin, spacer tubes and 3/8" flange nuts w/pin. See Below Deck Mount.
- 5) Place (6) pivot blocks on each of the 18 3/16" rods and tap rods into cut out grooves on panel using a plastic or rubber hammer. Continue this process until all (6) rods are in place. Refer to the Pivot Block Assembly Detail.
- 6) Attach the rod covers using 3/8" x 1 1/8" BHCS w/pin and 3/8" flange nuts w/pin.
- 7) Install 1/4" x 5/8" drive rivets in all 5" half clamps. Refer to the Typical Offset Hanger Clamp Spec Sheet.
- 8) Install protective surfacing before users are allowed to play on the structure.

**DETAIL
PIVOT BLOCK ASSEMBLY**

NOTE: Deck mount panel needs to have panel facing away from the deck, allowing user to read the panel from where they are located.





Kids In Motion 164075 Bobble Rider™, Double
Sheet 1 of 2

601 7TH STREET SOUTH, DELANO, MINNESOTA 55328-8605 888-574-4678 LSI Install Help 888-438-6574 LSI Direct 763-972-5200 Int. FAX (763) 972-3185

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Document #24927700



Kids In Motion 164075 Bobble Rider™, Double

Parts List

Part#	Description	Qty.
132912	Spring/Wedge Assembly, Black	2
160586	Seat, Black	2
185341	Double Bobble Rider, Specify Color.....	1
164058	Footer (DB), Black	1
164318	Spring Bottom Plate (SM), Black.....	1
183887	Double Bobble Rider Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST	8
100362	3/8" Flat Washer, SST	8
100363	1/2" Flat Washer, SST	8
129692	1/2" Hex Patch Nut, SST.....	8
129693	1/2" Hex Jam Nut, SST	8
130824	1/2" x 2 1/4" Flat Head Cap Screw, SST	8
156846	Play Safe Label 2-12 Years.....	1
183064	Warning Label	1
121868	Spring Animal Anchor Hardware Package (SM) ...	1
100262	1/2" x 6" Anchor Bolt.....	6
100322	1/2" Standard Hex Nut, SST	6
100363	1/2" Flat Washer, SST	6

DB = Direct Bury
SM = Surface Mount

Specifications

Double Bobble Rider:	Weldment comprised of 1.315" O.D. RS20 (.080"-.090" wall) galvanized steel tubing, 2.375" O.D. RS20 (.095"-.105" wall) galvanized steel tubing, 3/8" HRPO steel plate, 1/4" HRPO steel plate, and 4" diameter 10 GA. (.135") low carbon steel ball. Finish: ProShield®, color specified.
Spring:	Weldment comprised of 5 3/8" diameter 13/16" tempered alloy steel coil. Finish: ProShield, black in color.
Seat:	Rotationally molded from U.V. stabilized linear low density polyethylene, black in color.
Spring Bottom Plate:	Fabricated from 3/8" x 10" x 17" sheet HRPO steel. Finish: ProShield, black in color.
Footer:	Weldment comprised of 3 1/2" O.D. RS20 (.120" - .130" wall) galvanized steel tubing and 1/4" x 10" x 17" sheet HRPO steel. Finish: ProShield, black in color.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
Installation Time:	SM - Approx. 2 man hours DB - Approx. 2 1/4 man hours
Concrete Req.:	DB - Approx. 5.25 cu. ft.
Area Req.:	15'-3" x 13'-8" (4,64 m x 4,17 m) Minimum Use Zone
Weight:	(SM) 113 lbs (DB) 137 lbs
Seat Height:	20 3/4" (527 mm)

Installation Instructions

(Direct Bury)

- 1) Dig footing hole as shown.
- 2) Attach Bobble Rider to spring/wedge assemblies using 1/2" x 2 1/4" flat head cap screws, 1/2" flat washers, 1/2" hex patch nuts and 1/2" hex jam nuts, as shown.
- 3) Attach spring/wedge assemblies to footer using 1/2" x 2 1/4" flat head cap screws, 1/2" flat washers, 1/2" hex patch nuts and 1/2" hex jam nuts.
- 4) Attach seats to Bobble Rider using 3/8" x 7/8" BHCS w/pin and 3/8" flat washers.
- 5) With footer plumb and Bobble Rider propped up, pour concrete footing and let cure for a minimum of 72 hours before using.
- 6) Apply labels as shown.
- 7) Install protective surfacing before users are allowed to play on the component.

(Surface Mounting On A Concrete Slab)

- 1) Using the spring bottom plate as a pattern, make a plywood template for anchor bolt placement. Attach 1/2" x 6" anchor bolts with 1/2" standard hex nuts and 1/2" flat washers to holes in template.
- 2) Pour concrete slab and lay template on surface in level position. Push 1/2" x 6" anchor bolts into concrete and allow 3/4" to 7/8" of thread to protrude from concrete. Allow 72 hours before template removal.
- 3) Attach spring/wedge assemblies to spring bottom plate using 1/2" x 2 1/4" flat head cap screws, 1/2" flat washers, 1/2" hex patch nuts and 1/2" hex jam nuts.
- 4) Attach spring bottom plate to anchor bolts in concrete with 1/2" standard hex nuts and 1/2" flat washers.
- 5) Attach Bobble Rider to spring/wedge assemblies using 1/2" x 2 1/4" flat head cap screws, 1/2" flat washers, 1/2" hex patch nuts and 1/2" hex jam nuts, as shown.
- 6) Attach seats to Bobble Rider using 3/8" x 7/8" BHCS w/pin and 3/8" flat washers.
- 7) Apply labels as shown.
- 8) Sufficient protective surfacing for a 2' fall height should cover bottom plate and anchor bolts. (See ASTM F1487, Section 9.)

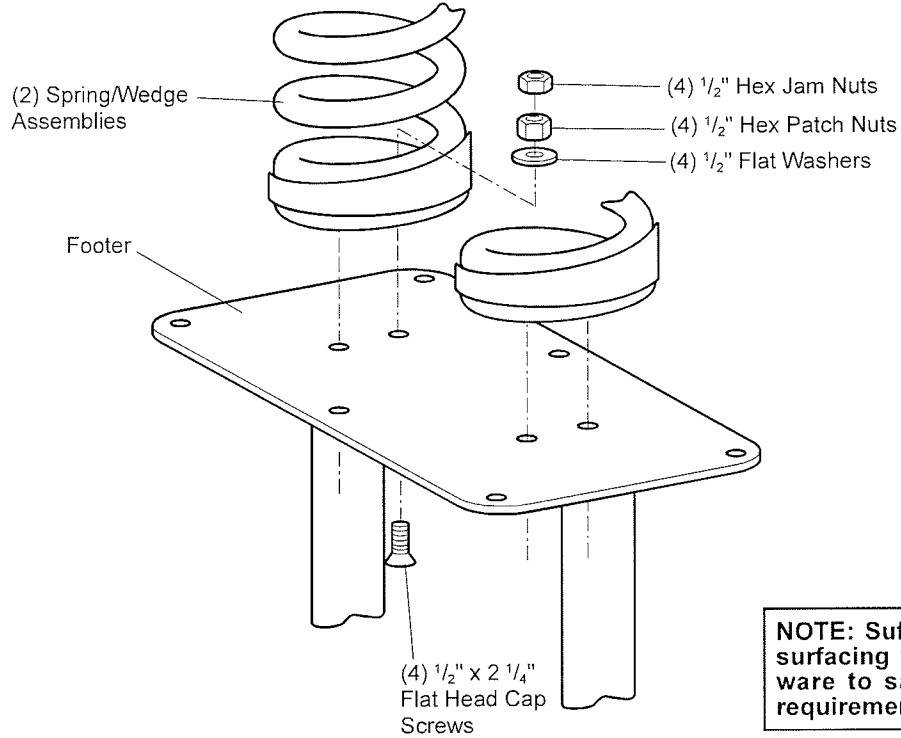
Eco #0101409 Document #24927700 replaces #18563400. Correct dimensions on install for area required minimum use zone.

Specifications are subject to change without notice.

SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

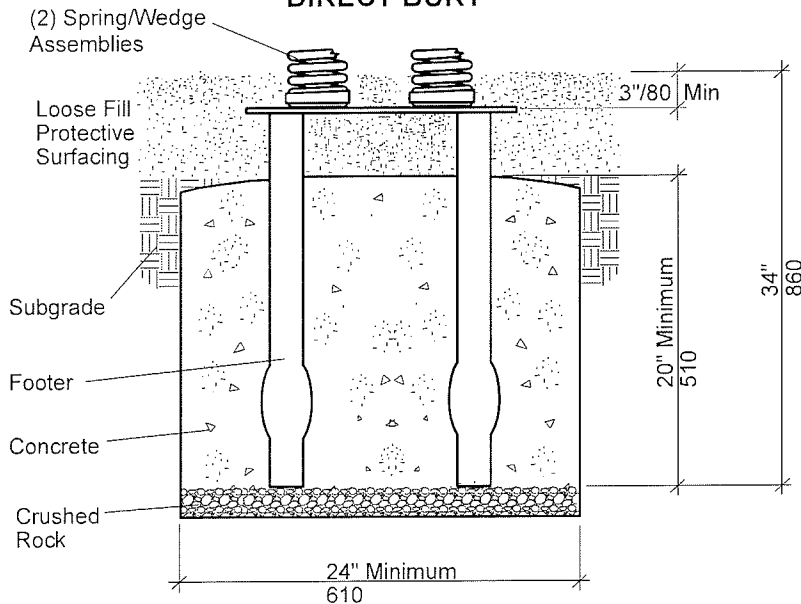
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**DETAIL
DIRECT BURY
BASE LEG ATTACHMENT**

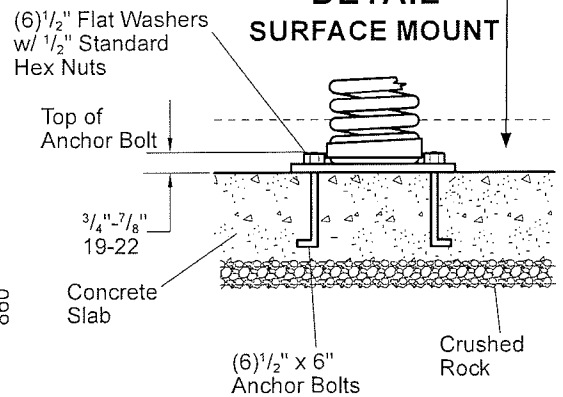


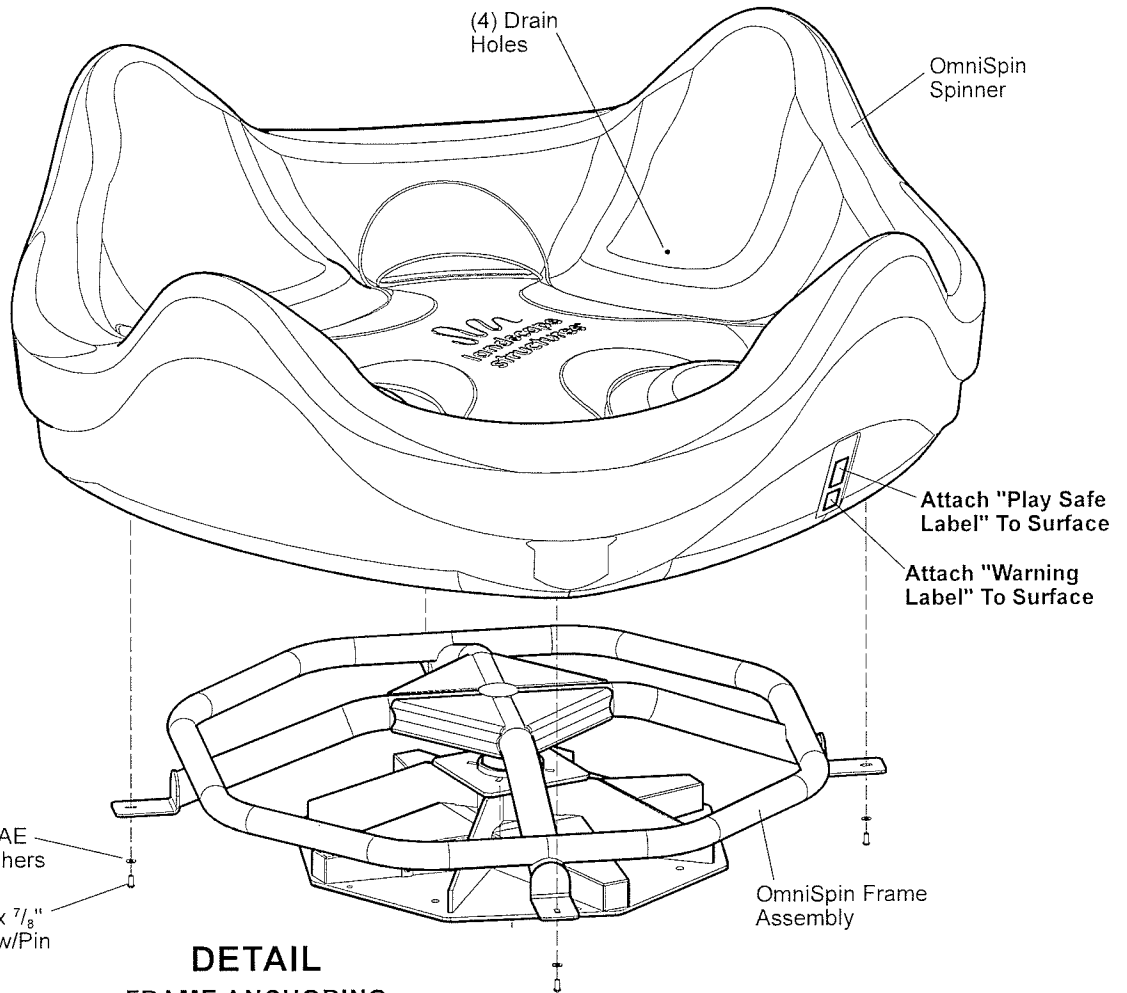
NOTE: Sufficient protective surfacing must cover hardware to satisfy fall height requirements.

**DETAIL
DIRECT BURY**

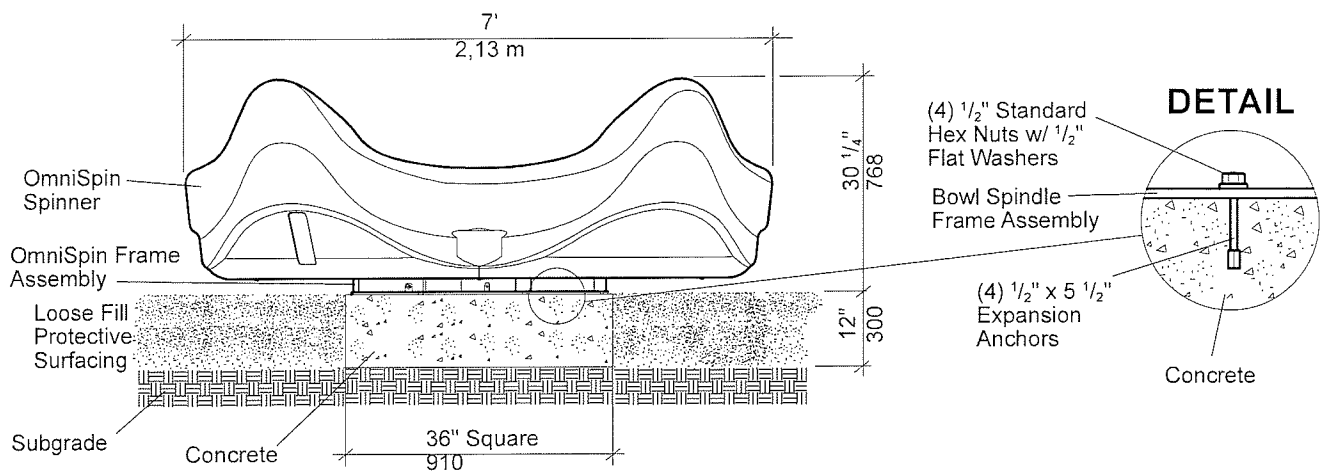


**DETAIL
SURFACE MOUNT**





**DETAIL
FRAME ANCHORING**



Kids in Motion 173591 OmniSpin® Spinner



Kids in Motion 173591 OmniSpin® Spinner

Parts List

Part#	Description	Qty.
171060	OmniSpin Spinner, Specify Color.....	1
171061	OmniSpin Spinner Frame Assy., Metallic Silver.....	1
183892	OmniSpin Spinner Hardware Package	1
100196	3/8" x 7/8" BHCS w/Pin, SST.....	4
100365	3/8" SAE Flat Washer, SST.....	4
156846	Play Safe Label, 2-12 Years.....	1
183064	Warning Label.....	1
175599	4 Hole (SM) Hardware Package	1
100271	1/2" x 5 1/2" Expansion Anchor w/Nut/Washer.....	4

SM = Surface Mount

Specifications

OmniSpin Spinner: Rotationally molded from U.V. stabilized linear low density polyethylene, color specified.

OmniSpin Spinner

Frame Assembly: (Frame) Weldment comprised of 2.375" O.D. RS20 (.095"-.105" wall) galvanized steel tubing, 2.875" O.D. RS40 (.160"-.170" wall) galvanized steel tubing, 1/4" HR flat steel and 3 1/2" O.D. CF steel bar. (Base) Weldment comprised of 3/8" HRPO sheet steel and 3/16" HRPO sheet steel. (Shock Covers) 16 GA (.060") HRPO sheet steel. (Crank Arms & Pins) Fabricated from stainless steel. (Shocks) Gas shocks with fixed bearings. Finish: ProShield®, metallic silver in color.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: (Direct Bury) Concrete Footing - 2 People approx. 3 hours

Assembly - 3 People 1 hour

Concrete: (Direct Bury) 9 cu. ft.

Weight: 499 lbs.

Actual Size: 7' x 7' (2,13 m x 2,13 m)

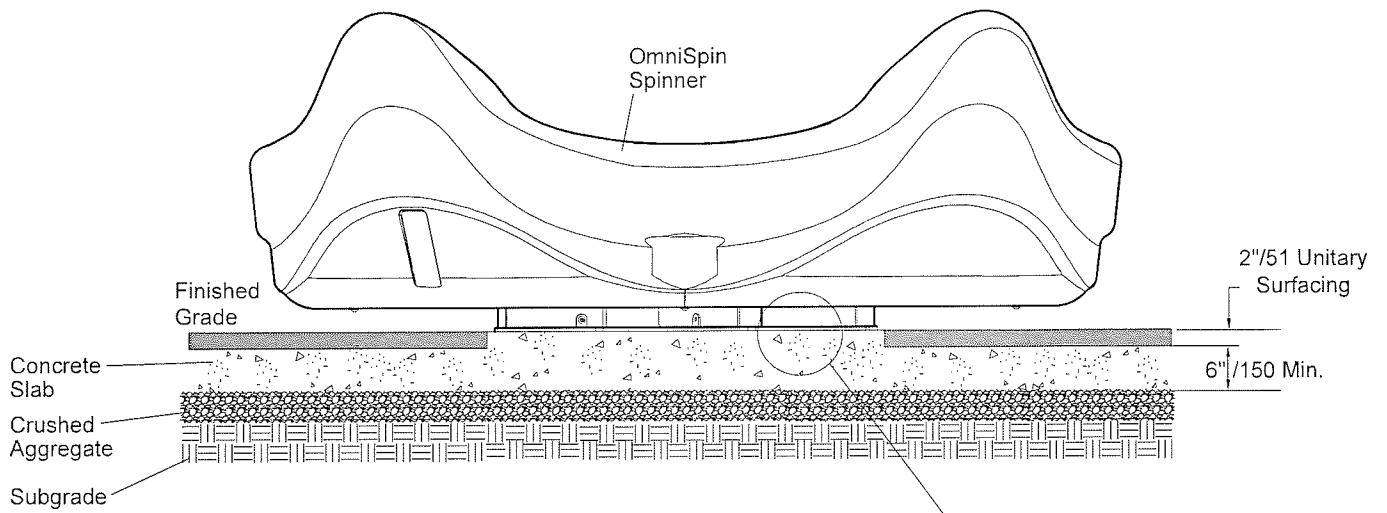
Area Required: 19' (5,79 m) Diameter ASTM

Fall Height: 18" (460 mm)

Installation Instructions

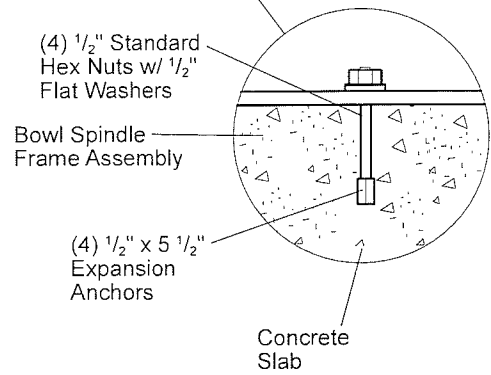
- 1) **(Direct Bury)** Build and pour concrete footing. Refer to Frame Anchoring Details. Allow concrete footing to cure for a minimum of 72 hours before continuing.
- 2) With OmniSpin Spinner frame in position, drill through 4 outside holes in OmniSpin Spinner frame 5 1/2" deep into concrete slab, using 1/2" masonry bit and hammer drill. Refer to the Frame Anchoring Detail.
- 3) Tap 1/2" x 5 1/2" expansion anchors into drilled holes and secure using 1/2" standard hex nuts with 1/2" flat washers. Refer to the Frame Anchoring Details.
- 4) Attach OmniSpin Spinner to OmniSpin Spinner frame, using 3/8" x 7/8" BHCS w/pin and 3/8" SAE flat washers.
- 5) Apply labels as shown.
- 6) Install protective surfacing before users are allowed to play on the component.

Unitary Surfacing

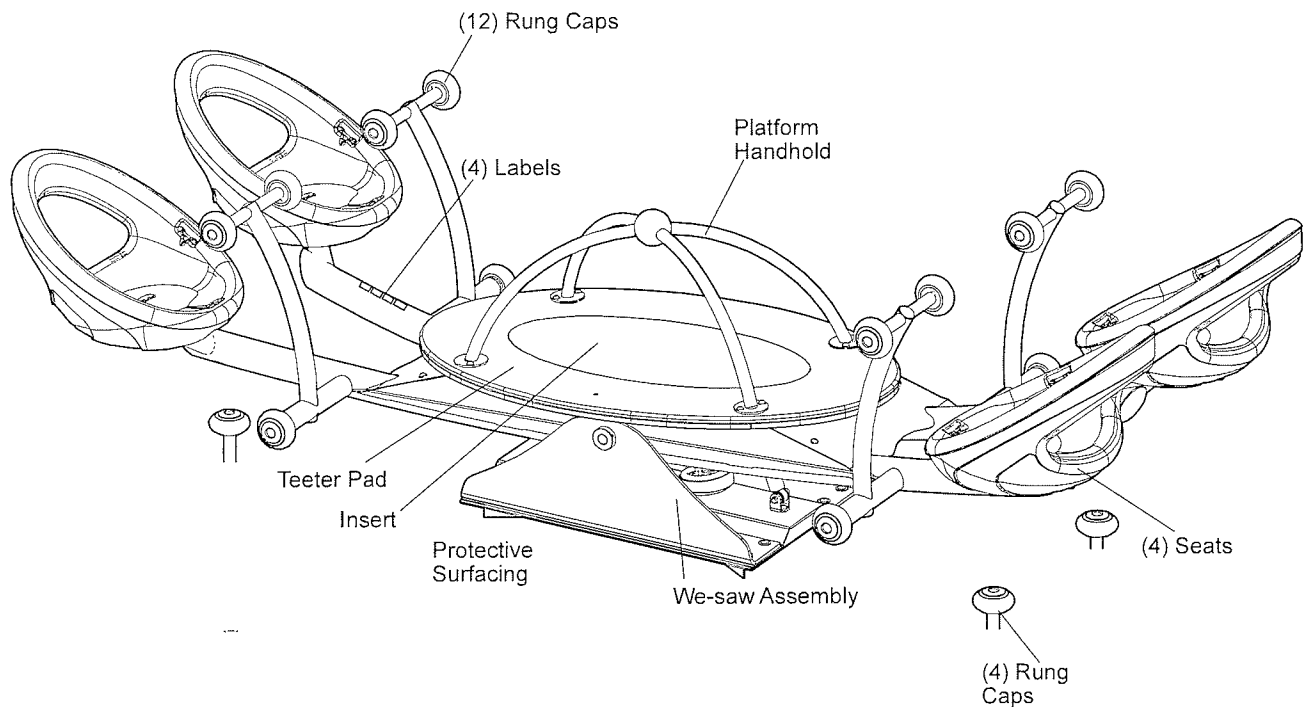
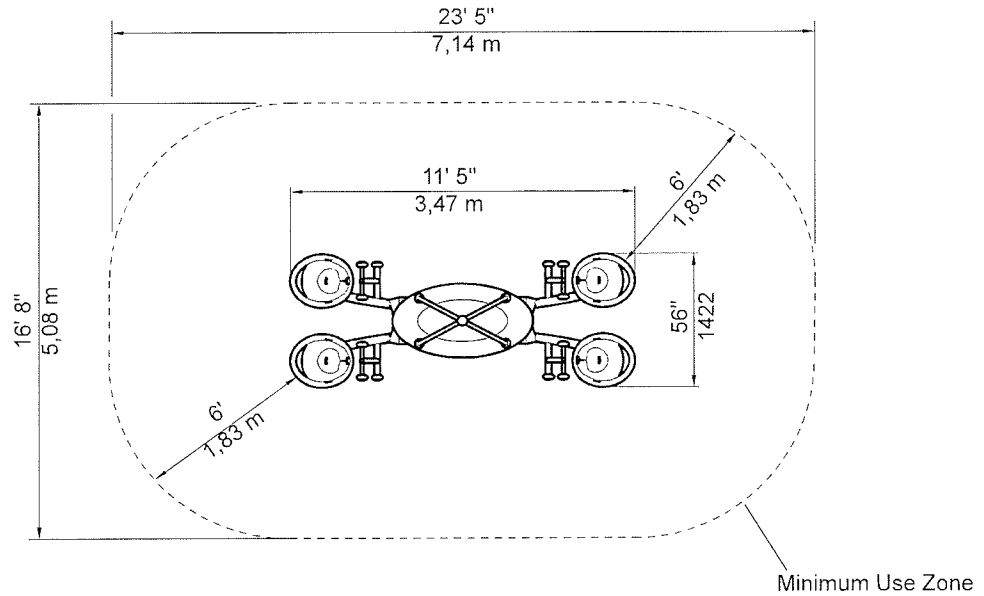


NOTE: When using unitary surfacing on crushed aggregate, refer to Frame Anchoring Detail for loose fill protective surfacing.

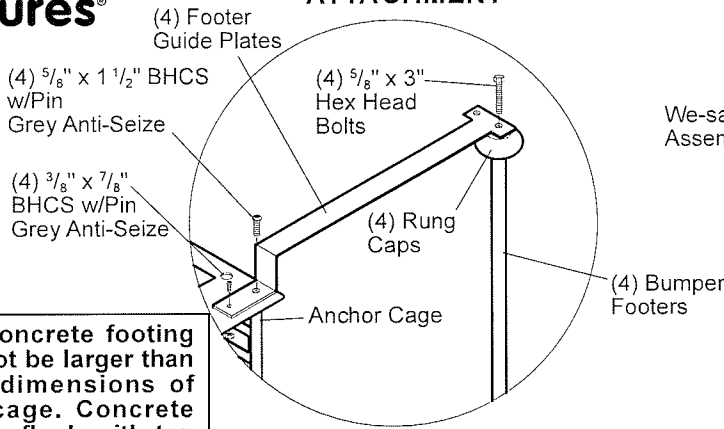
DETAIL



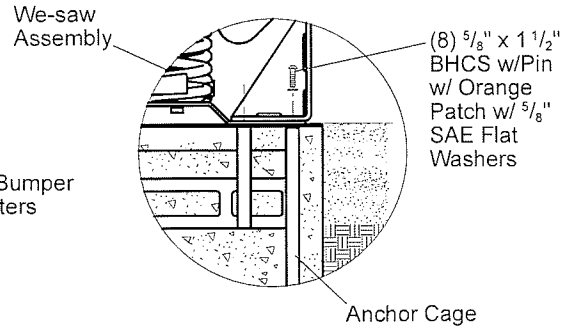
PLAN VIEW



**DETAIL
BUMPER FOOTER
ATTACHMENT**

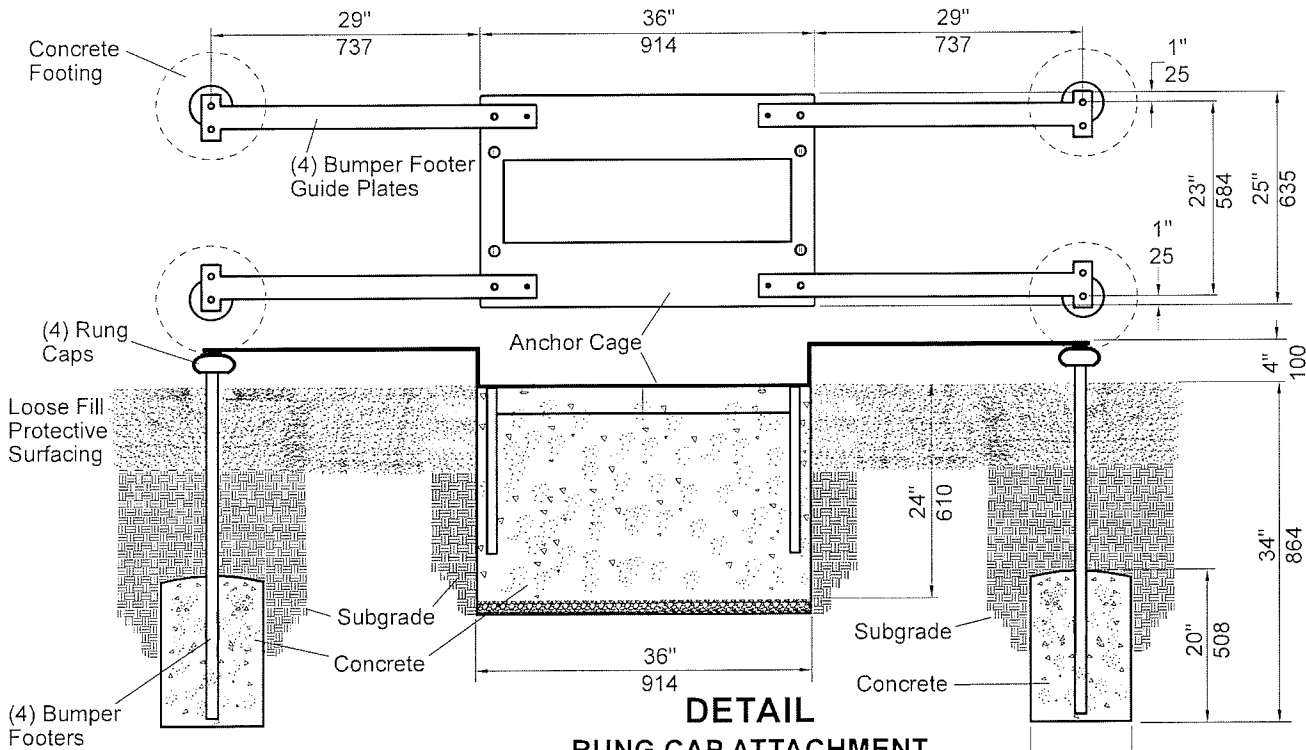


**DETAIL
WE-SAW ASSEMBLY
ATTACHMENT**

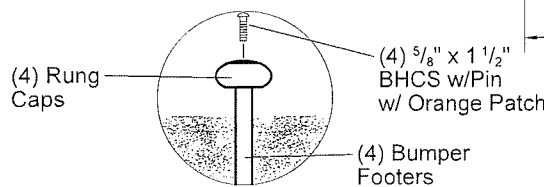


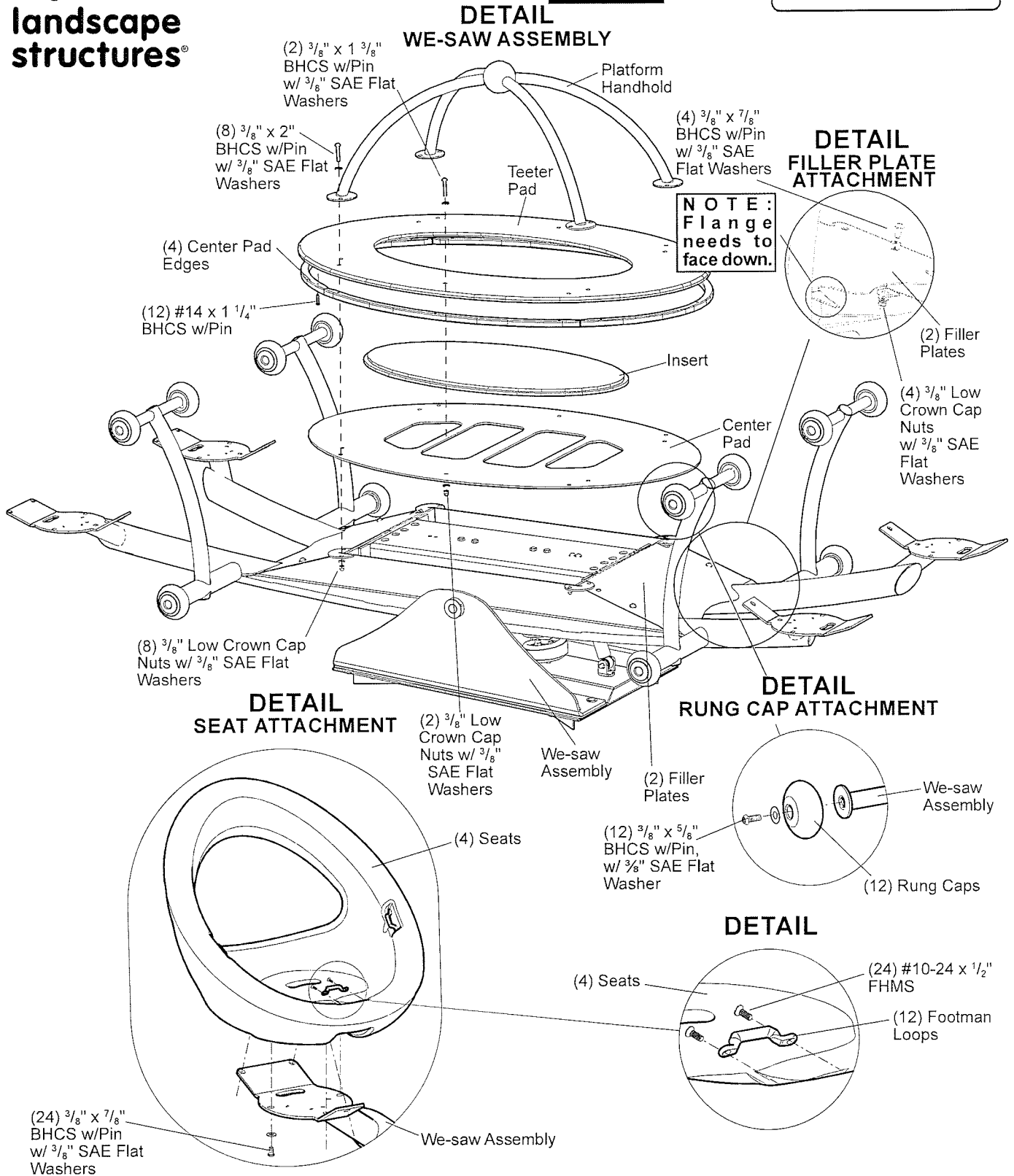
NOTE: Concrete footing should not be larger than outside dimensions of anchor cage. Concrete should be flush with top of anchor cage.

**DETAIL
CONCRETE FOOTINGS
(WITH FOOTER GUIDE PLATES)**



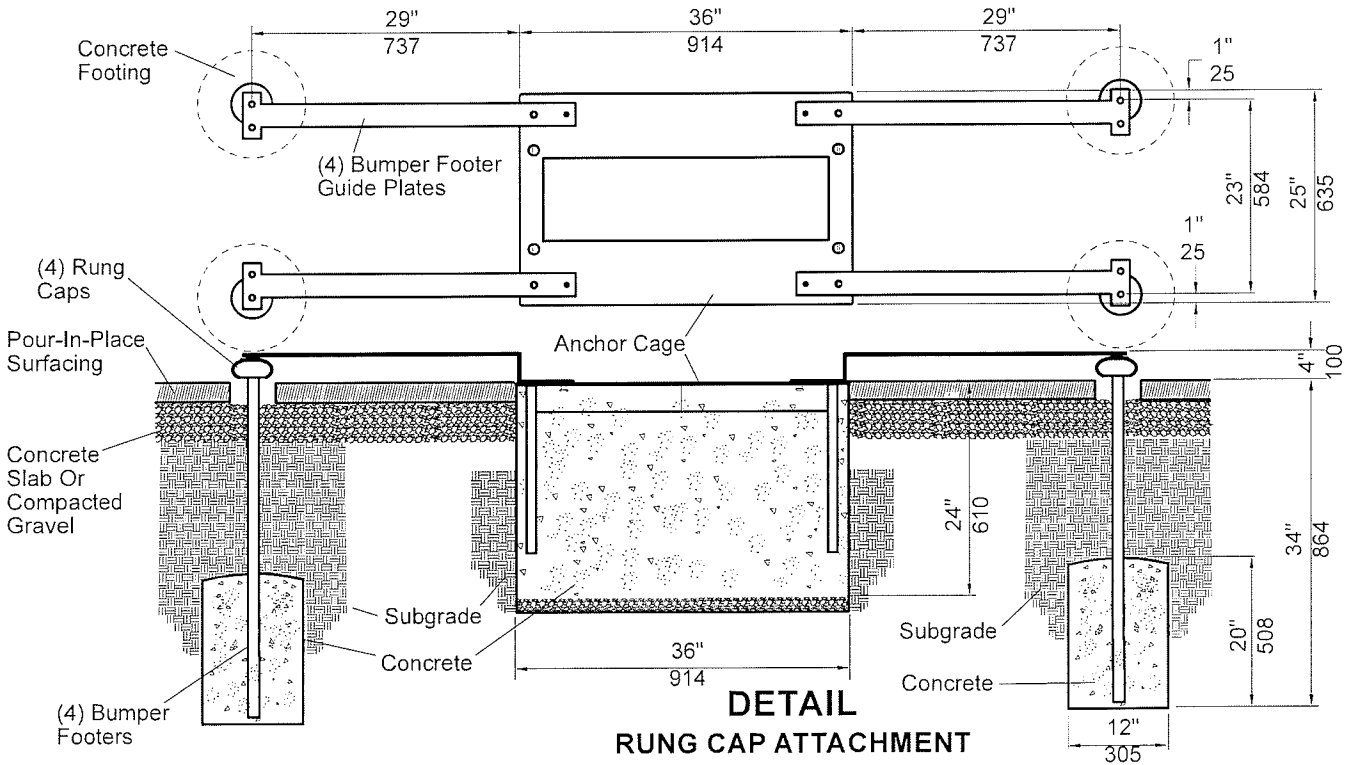
**DETAIL
RUNG CAP ATTACHMENT**



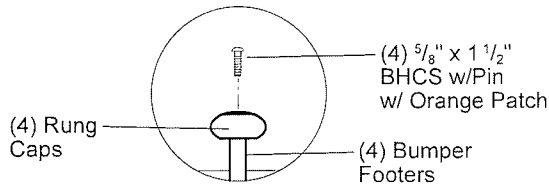


DETAIL
DIRECT BURY WITH
POUR-IN-PLACE SURFACING

CONCRETE FOOTINGS
(WITH FOOTER GUIDE PLATES)



DETAIL
RUNG CAP ATTACHMENT





Kids In Motion 186490 We-saw™

Parts List

Part#	Description	Qty.
181123	Seat, Specify Color.....	4
182262	Rung Cap, Black.....	16
182458	Platform Handhold, Specify Color.....	1
182947	Center Pad, Black.....	1
211277	GripX Insert, Black.....	1
183327	Teeter Pad, Specify Color.....	1
183328	Pad Edge Long, Specify Color.....	2
183329	Pad Edge Short, Specify Color.....	2
183748	Filler Plate, Specify Color.....	2
186453	Anchor Cage, Black.....	1
187231	Bumper Footer, Specify Color.....	4
273373	We-saw Assembly, Specify Color.....	1
186951	Footer Guide Plate, Black.....	4
249513	We-saw Hardware Package	1
100173	3/8" x 2" BHCS w/Pin, SST.....	8
100196	3/8" x 7/8" BHCS w/Pin, SST.....	28
100201	5/8" x 1 1/2" BHCS w/Pin, SST-Patch.....	12
100365	3/8" SAE Flat Washer, SST.....	64
129500	5/8" SAE Flat Washer, SST.....	8
129672	#14 x 1 1/4" TORX BHCS, SST.....	12
207709	Footman Loop, SST.....	12
162462	#10-24 x 1/2" FHMS.....	24
115176	ASTM Hard Surface Warning Label.....	1
156846	Play Safe Label, 2-12 Years.....	1
182212	Entanglement Warning Label.....	1
182213	Hot Surface Warning Label.....	1
100349	3/8" Low Crown Cap Nut, SST.....	14
127463	Bit Hex TPP T-27 Torx.....	1
113027	3/8" x 1 3/8" BHCS w/Pin, SST.....	2
100195	3/8" x 5/8" BHCS w/Pin, SST.....	12
188123	Bumper Guide Plate Hardware Package	1
127546	3/8" x 7/8" BHCS w/Pin, SST.....	4
127551	5/8" x 1 1/2" BHCS w/Pin, SST.....	4
188124	5/8" x 3" Hex Cap Screw, ZP.....	4

Specifications

We-saw Assembly: (Arm Assembly) Weldment comprised of 3.500" (88,9 mm) O.D. x 8 GA. (.162") (4,11 mm) wall galvanized steel tubing, 2.375" (60,33) O.D. RS40 (.130"-.140") (3,30 mm-3,56 mm) wall galvanized steel tubing, 1.900" (48,26 mm) O.D. RS40 (.120"-.130") (3,05 mm-3,30 mm) wall galvanized steel tubing, .375" (9,52 mm) thick HRPO steel plate and .250" (6,35 mm) stainless steel plate. Finish: ProShield®, specify color. (Rocker Assembly) Weldment comprised .250" (6,35 mm) HRPO steel plate and 2" (50 mm) x 5/16" (7,93 mm) wall steel tubing. Finish: ProShield, Black in color. (Base) Weldment comprised .375" (9,53 mm) HRPO steel plate and 2.500" (63,50 mm) O.D. x 1.150" (29,21 mm) I.D. stainless steel tubing. Finish: ProShield, Black in color. (Base Plate) Fabricated from .250" (6,35 mm) HRPO steel plate. Finish: ProShield, Black in color. (Spring) 5 5/8" (142,87 mm) diameter 13/16" (20,62 mm) tempered alloy steel coil. Finish: ProShield, Black in color. (Spring Wedge) Cast from ductile iron alloy. Finish: ProShield, Black in color. (Bearings) 1.145" (29,08 mm) I.D. igus (Shaft) 1.14" (28,96 mm) O.D. stainless steel. (Cylinder) Chrome plated steel.

Filler Plate: Fabricated from 5052 Sheet Aluminum. Finish: ProShield, color specified.

GripX Insert: 3/4" (19,05 mm) Thick Permalene®, black in color.

Teeter Pad & Edges: Permalene®, color specified.

Platform Handhold: Weldment comprised of 1.315" (33,4 mm) O.D. RS20 (.080"-.090") (2,03 mm - 2,28 mm) wall galvanized steel tubing, 10 GA (.135") (3,42 mm) HRPO steel sheet and 7 GA. (.179") (4,54 mm) HRPO steel sheet. Finish: Proshield®, color specified.

Anchor Cage: Weldment comprised of 1.029" (26,13 mm) O.D. RS20 (.070"-.080") (1,77 mm - 2,03 mm) wall galvanized steel tubing with 203 or 303 stainless steel welded inserts with 5/8" internal threads and 7 GA. (.179") (4,54 mm) HRPO steel sheet. Finish: Proshield®, black in color.

Rung Cap: Molded from U.V. stabilized black EPDM rubber encapsulating .250" (6,35 mm) thick aluminum sheet and .125" (3,18 mm) thick aluminum plate.

Center Pad: Fabricated from .250" (6,35 mm) thick HRPO steel sheet plate. Finish: Proshield®, black in color.

Bumper Footer: Weldment comprised of 1.315" (33,40 mm) O.D. RS20 (.080"-.090") (2,03 mm - 2,29 mm) wall galvanized steel tubing with 203 or 303 stainless steel welded inserts with 5/8" internal threads and .250" (6,35 mm) thick stainless steel plate. Finish: Proshield®, color specified.

Seat: Rotationally molded from U.V. stabilized linear low density polyethylene, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: Approx. 16 man hours

Fall Height: 54" (1,37 m)

Min. Use Zone: 6' (1,83 m)

Area Required: 16' 8" x 23' 5" (5,08 m x 7,14 m)

Concrete Req.: Approx. 17.82 cu. ft.

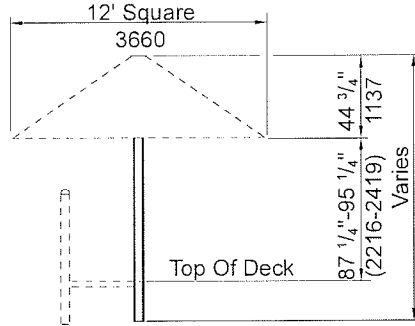
Weight: 783 lbs.

Specifications are subject to change without notice.

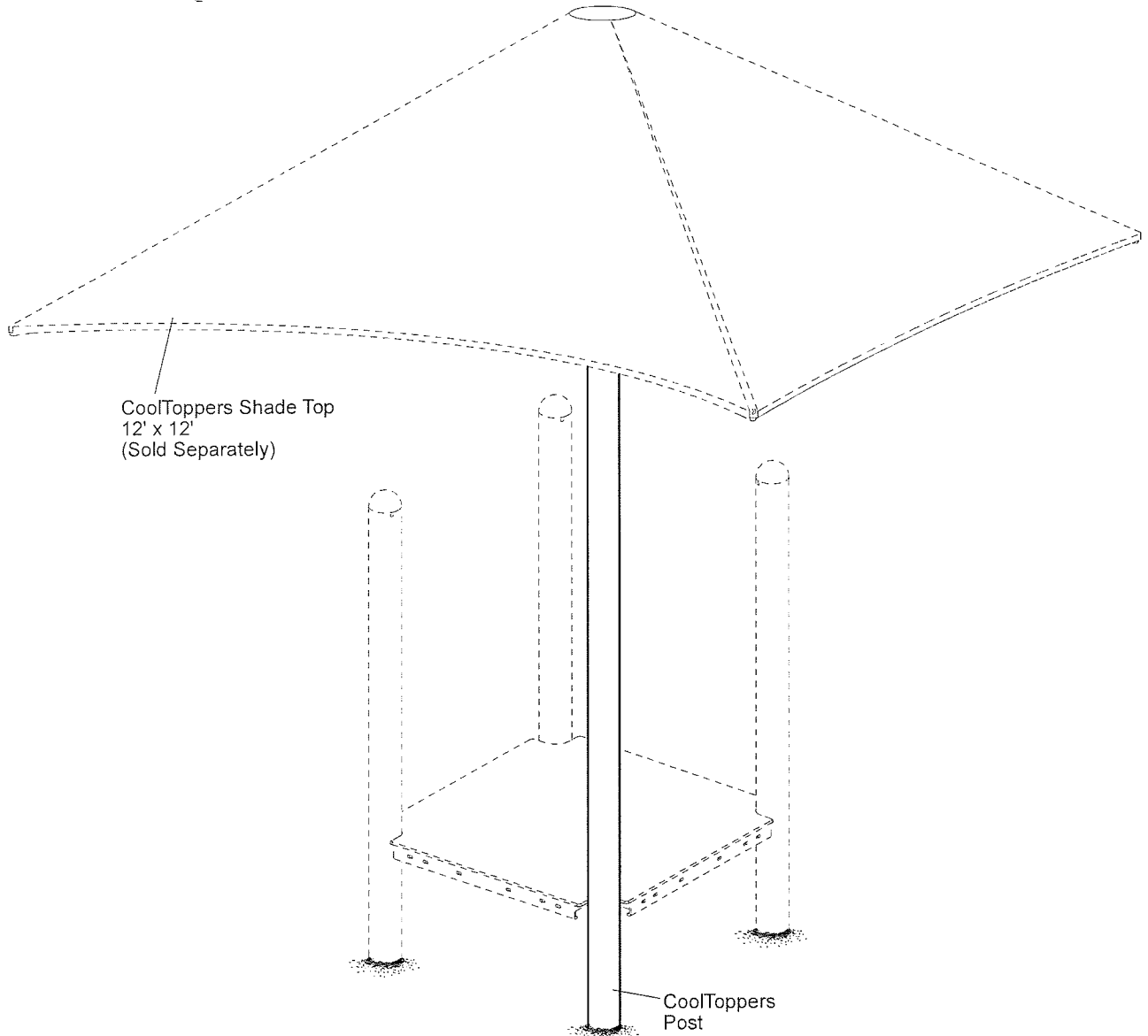
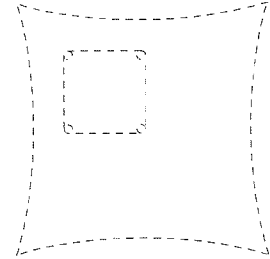
Installation Instructions

- 1) **(Direct Bury)** Dig footing holes for anchor cage and bumper footers. Build a form for anchor cage concrete footing. Concrete footing for anchor cage should not be larger than outside dimensions of anchor cage. Refer to Concrete Footing Details.
- 2) Attach rung caps and bumper footers to bumper footer guide plates using $\frac{3}{8}$ " x 3" hex head bolts. Refer to the Bumper Footer Attachment Detail.
- 3) Attach bumper footer guide plates to anchor cage using $\frac{3}{8}$ " x 1 $\frac{1}{2}$ " BHCS w/pin and $\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/pin. Refer to the Bumper Footer Attachment Detail.
- 4) Place anchor cage and bumper footers in footing holes, as shown. Top of anchor cage should be flush with finished grade. With anchor cage level and bumper footers plumb, pour concrete. Concrete should be flush with top of anchor cage. Allow concrete footing to cure for a minimum of 72 hours before continuing. Refer to the Concrete Footing Details.
- 5) Remove footer guide plates from anchor cage and bumper footers. Discard bumper guard plates and hardware. Attach rung caps to bumper footers using $\frac{3}{8}$ " x 1 $\frac{1}{2}$ " BHCS w/pin. Refer to the Rung Cap Attachment Detail.
- 6) Set We-saw assembly onto anchor cage. Line up holes in We-saw assembly bottom plate with threaded inserts in anchor cage. Attach We-saw assembly to anchor cage using $\frac{5}{8}$ " x 1 $\frac{1}{2}$ " BHCS w/pin with $\frac{5}{8}$ " SAE flat washers. Refer to the We-saw Assembly Attachment Detail.
- 7) Attach filler plates to We-saw assembly using #3/8 x 7/8" BHCS w/pin with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " low crown cap nuts with $\frac{3}{8}$ " SAE flat washers. Refer to the Filler Plate Attachment Detail. Make sure flanges on filler plates are pointing downwards.
- 8) Attach center pad edges to teeter pad, using #14 x 1 $\frac{1}{4}$ " BHCS w/pin. Refer to the We-saw Assembly Detail.
- 9) Attach platform handhold, teeter pad, insert and center pad to We-saw assembly attachment plates, using $\frac{3}{8}$ " x 2" BHCS w/pin with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " low crown cap nuts with $\frac{3}{8}$ " SAE flat washers. Refer to the We-saw Assembly Detail.
- 10) Attach teeter pad to center pad using $\frac{3}{8}$ " x 1 $\frac{3}{8}$ " BHCS w/pin with $\frac{3}{8}$ " SAE flat washers and $\frac{3}{8}$ " low crown cap nuts with $\frac{3}{8}$ " SAE flat washers. Refer to the We-saw Assembly Detail.
- 11) Attach rung caps to We-saw assembly using $\frac{5}{8}$ " x 1 $\frac{1}{2}$ " BHCS w/pin. Refer to the Rung Cap Attachment Detail.
- 12) Attach seats to We-saw assembly using $\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/pin with $\frac{3}{8}$ " SAE flat washers. Refer to the Seat Attachment Detail.
- 13) Attach footman loops, using #10-24 x $\frac{1}{2}$ " flat head screws, as shown. Footman loops are used for seat belts (not included).
- 14) Apply Play Safe and warning labels, as shown.
- 15) Install protective surfacing before users are allowed to play on the structure.

**DETAIL
FRONT VIEW**



**DETAIL
TOP VIEW**



PlayBooster® 154883 CoolToppers® Post For Roofs, Single Post



PlayBooster® 154883 CoolToppers® Posts For Roofs, Single Post

Parts List

Part#	Description	Qty.
153697	5" O.D. x 220 1/2" Mast (16"-72"), Specify Color.....	1
154804	5" O.D. x 200 1/2" Mast (GRD, 8"),Specify Color.....	1
154046	12" Footer Extension (32"-40"), Specify Color.....	1
154044	28" Footer Extension (48"-56"), Specify Color.....	1
154043	44" Footer Extension (64"-96"), Specify Color.....	1
244382	Middle Post 96" Deck, Specify Color.....	1
244384	Upper Post Extension 96" Deck, Specify Color.....	1
155083	DB Post Extension (32"-96") Hdw. Package	1
100198	3/8" x 1 1/8" BHCS w/Pin, SST.....	4
100327	3/8" Standard Hex Nut, SST.....	4
100362	3/8" Flat Washer, SST.....	8
246727	Upper Post Extension 96" Deck	1
113027	3/8" x 1 3/8" BHCS w/Pin, SST.....	6
136931	3/8" - 16 Hex Nut Nylock.....	6
100365	3/8" Flat SAE Washer, SST.....	12

DB=Direct Bury

Specifications

CoolToppers Post:	Weldment comprised of 5" O.D. x 7 GA (.179") galvanized steel tubing and 1/4" steel plate. Finish: ProShield, color specified.
Footer Extension:	Weldment comprised of 5" O.D. x 11 GA (.120") galvanized steel tubing and 1/4" steel plate. Finish: ProShield, color specified.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
Upper Post Ext:	Weldment comprised of 5" OD x 11 GA (.120") galvanized steel tubing with 1/4" steel plate ZP and 3/8" steel plate. Finish: ProShield, color specified.
Middle Post:	Weldment comprised of 5" OD x 7 GA (.179") galvanized steel tubing with 1/4" steel plate ZP and 3/8" steel plate. Finish: ProShield, color specified.
Installation Time:	Post - 2 People Approx. 1 hour
Concrete:	12 cu. ft.
Weight:	172 lbs. (201" Post) 188 lbs. (221" Post) 200 lbs. (233" Post) 211 lbs. (249" Post) 222 lbs. (265" Post) 253 lbs. (301" Post)

Installation Instructions

- 1) Dig footing hole as shown.
- 2) **(201" & 221" Post)** Place post in footing hole. With post braced plumb pour concrete footing. **NOTE:** Allow concrete footing to cure for a minimum of 72 hours before attaching CoolToppers shade top.

(233", 249" & 265" Post) Attach post extension to CoolToppers post using 3/8" x 1 1/8" BHCS w/pin with 3/8" flat washers and 3/8" standard hex nuts with 3/8" flat washers. Place post in footing hole. With post braced plumb pour concrete footing. **NOTE:** Allow concrete footing to cure for a minimum of 72 hours before attaching CoolToppers shade top.

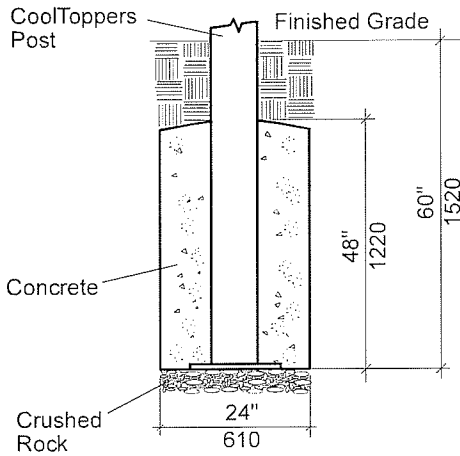
(301" Post) Attach DB post extension to middle post using 3/8" x 1 1/8" BHCS w/pin with 3/8" flat washers and 3/8" standard hex nuts with 3/8" flat washers. Attach upper post extension to middle post using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" low crown cap nuts with 3/8" SAE flat washers. With post braced plumb pour concrete footing. **NOTE:** Allow concrete footing to cure for a minimum of 72 hours before attaching CoolTopper Shade top.

Specifications are subject to change without notice.

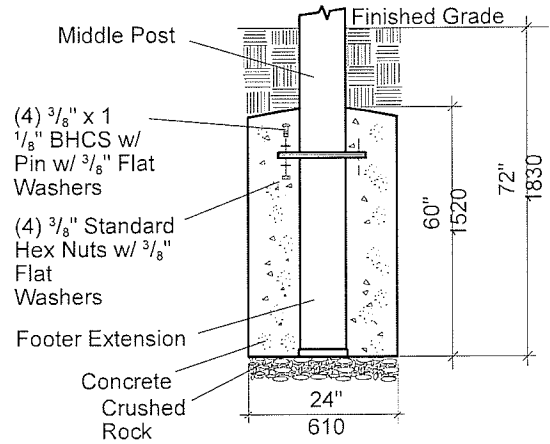
ECO 0101995 Document 27895500 replaces 24673000. removed deck heights added post length to bury detail.

SAFETY NOTE
 Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)

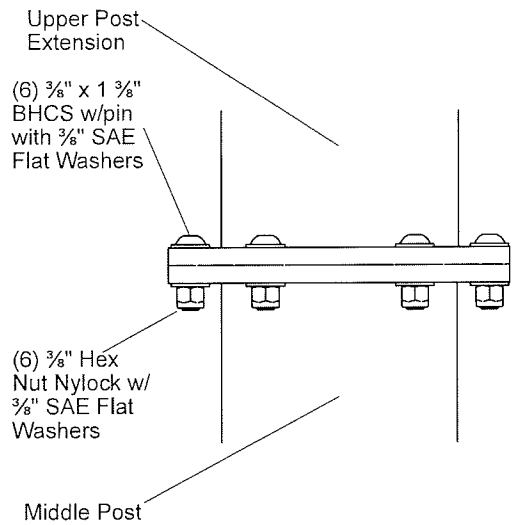
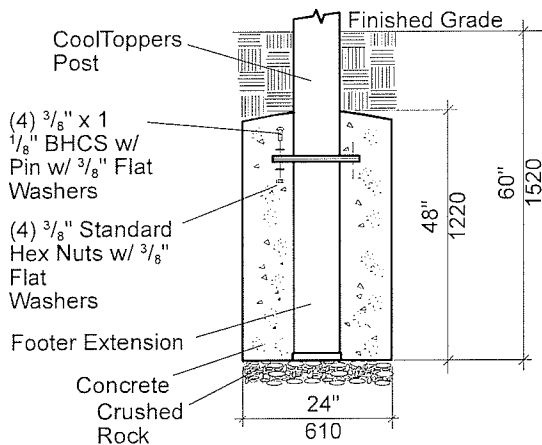
**DETAIL
 DIRECT BURY
 (201" & 221" POST)**



**DETAIL
 DIRECT BURY
 (301" POST)**



**DETAIL
 DIRECT BURY
 (233", 249", & 265" POST)**

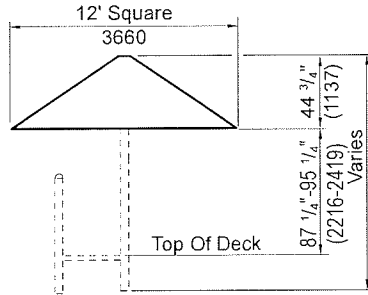


PlayBooster® 154883 CoolToppers® Post For Roofs, Single Post

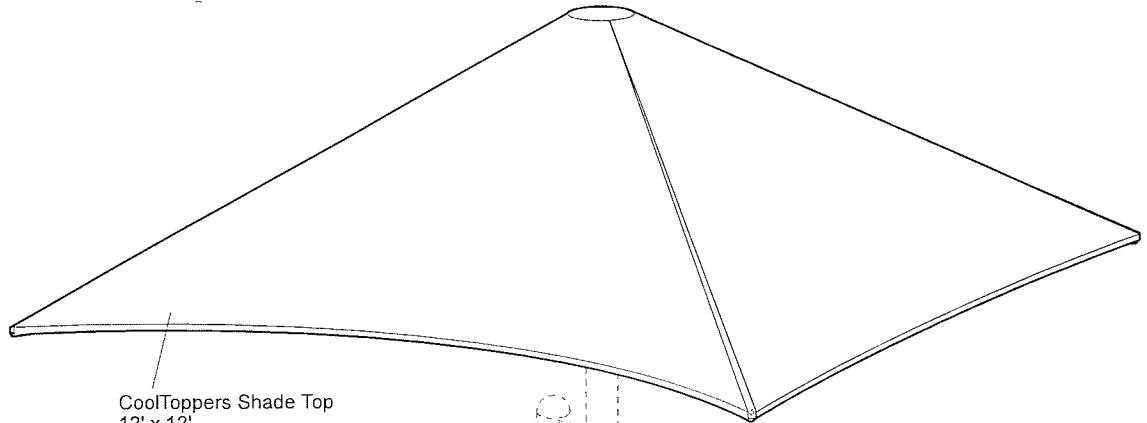
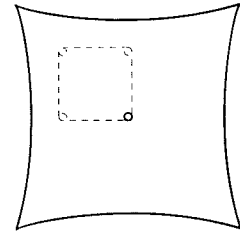
601 7TH STREET SOUTH, DELANO, MINNESOTA 55328-8605 888-574-4678 LSI Install Help 888-438-6574 LSI Direct 763-972-5200 Int. FAX (763) 972-3185

NOTE: Remove fabric when wind speeds are expected to exceed 90 mph and snow loads are expected to exceed 5 psf.

**DETAIL
FRONT VIEW**



**DETAIL
TOP VIEW**

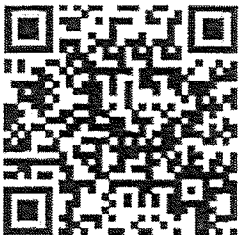


CoolToppers Shade Top
12' x 12'

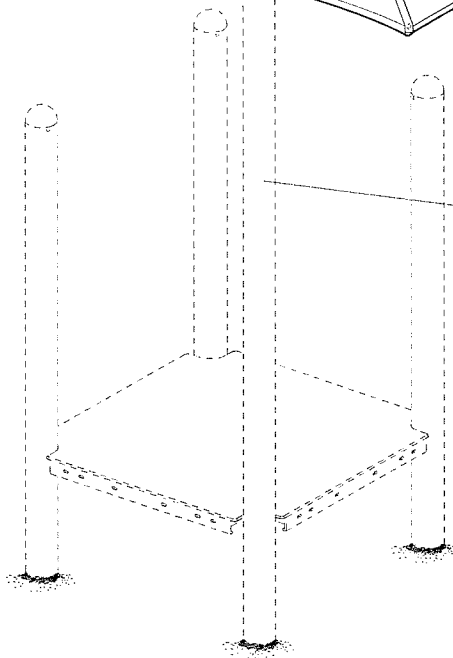
WARNING:

Fabric is designed to fit extremely tight over framework. Failure to follow instructions, resulting in a torn fabric, will not be warranted by LSI

Refer to video via QR code below for demonstration

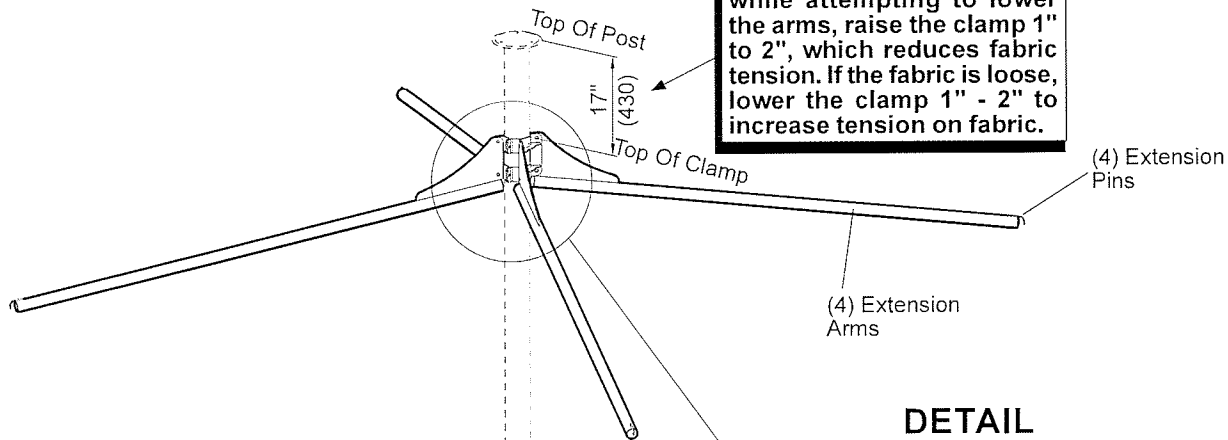


CoolToppers Post
(Sold Separately)

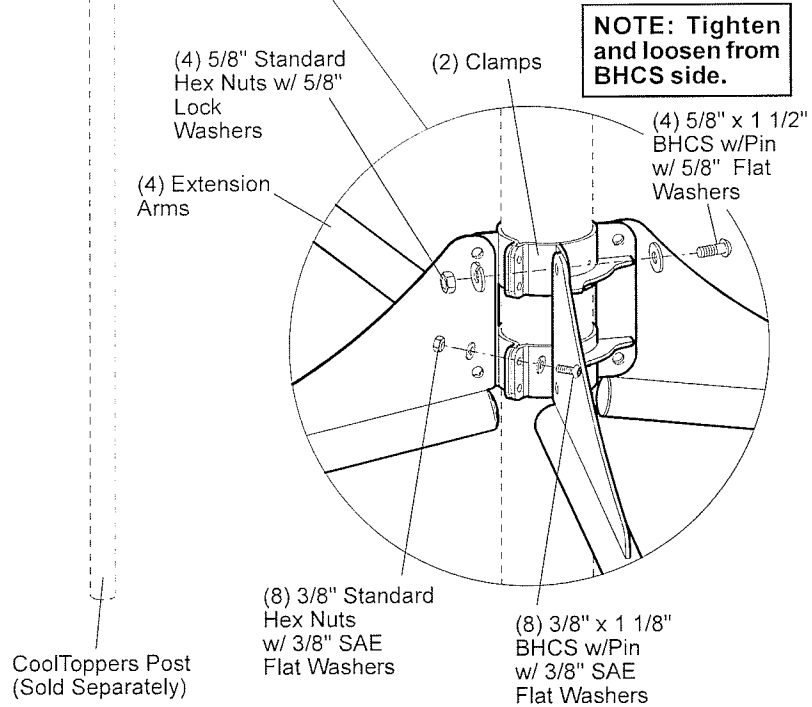


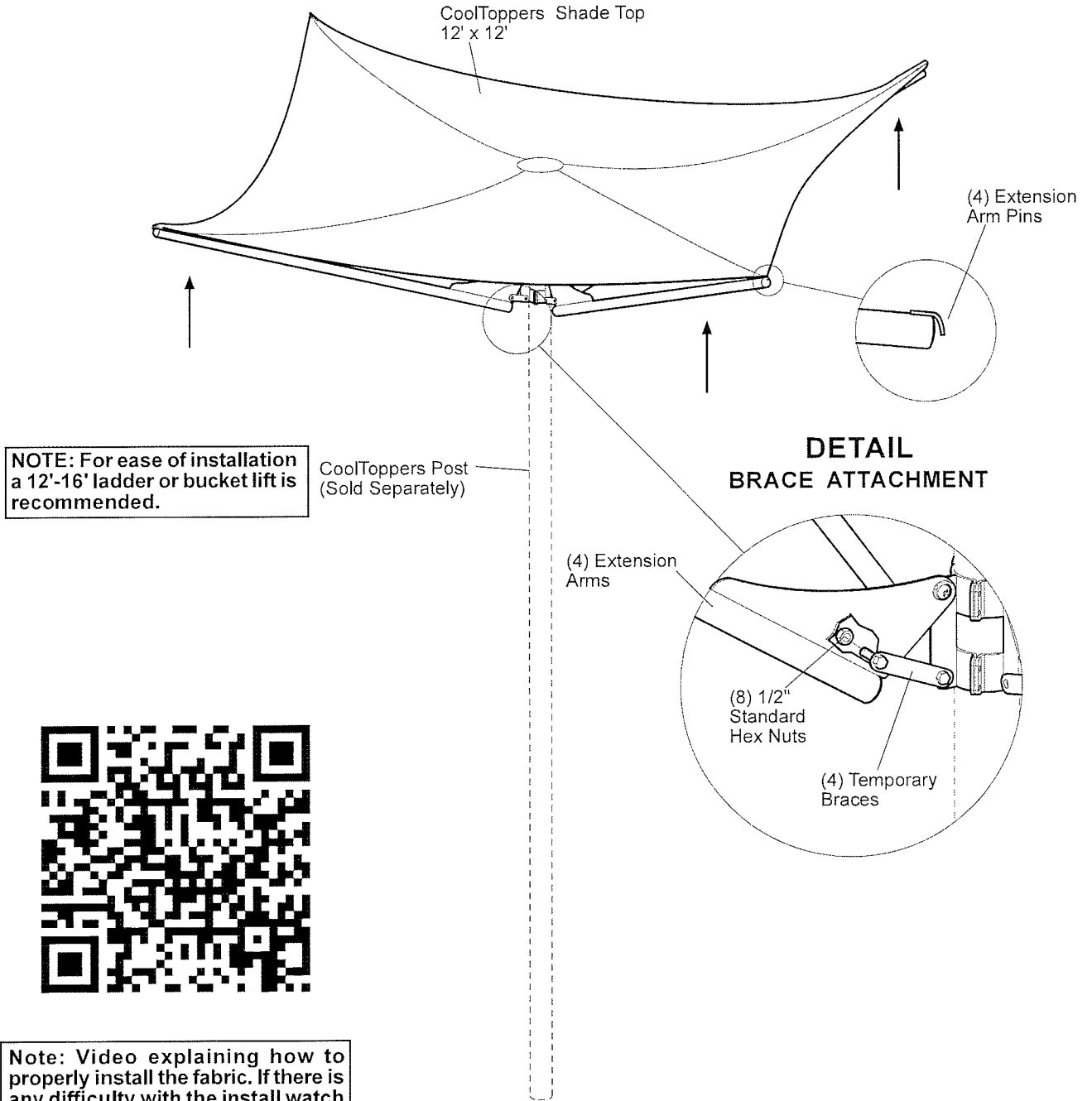
NOTE: Refer to Site Plan for orientation of extension arms.

NOTE: 17" is an approximate measurement from the top of post to top of clamp. Field adjustment of the clamp height may be required to achieve proper fabric tension. If fabric seems extremely tight, while attempting to lower the arms, raise the clamp 1" to 2", which reduces fabric tension. If the fabric is loose, lower the clamp 1" - 2" to increase tension on fabric.

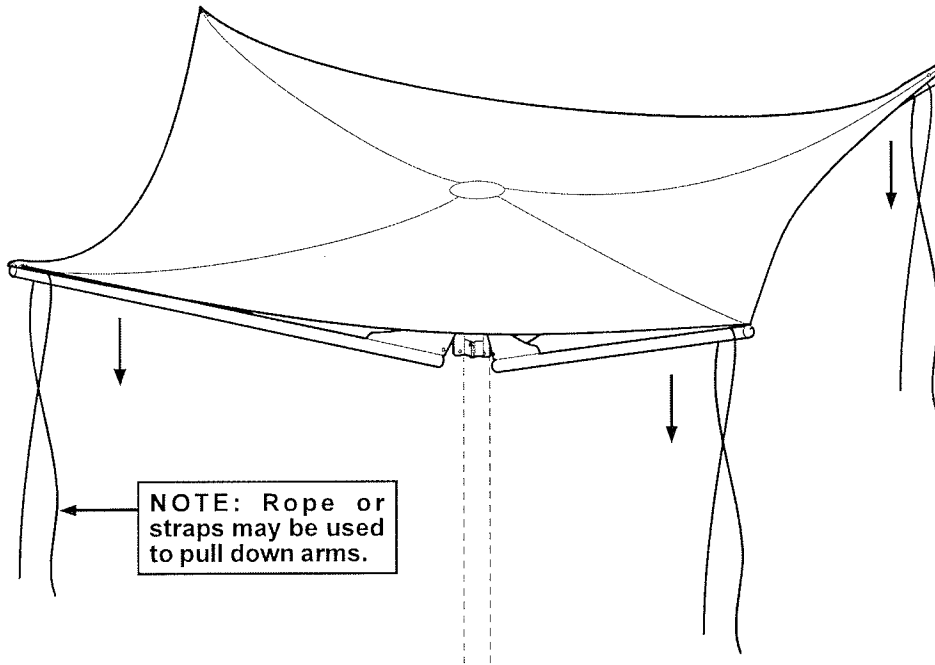


**DETAIL
UPPER ARM ATTACHMENT**

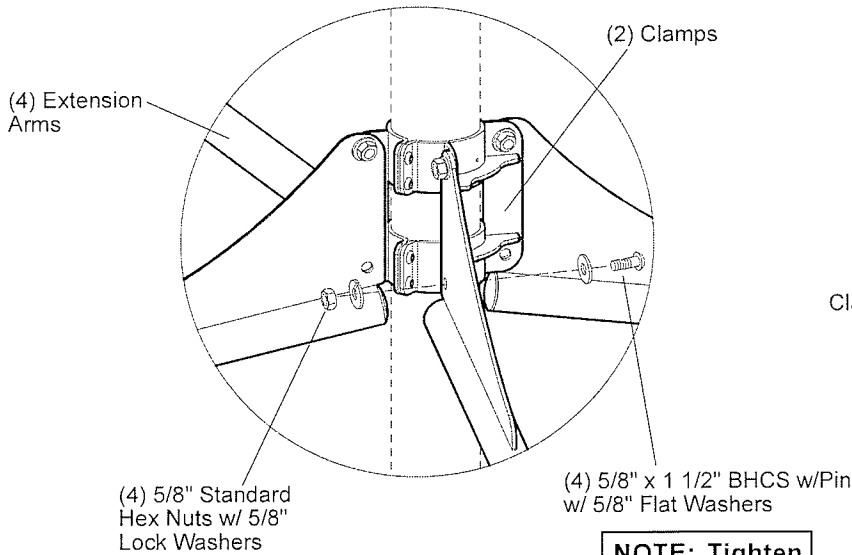




Note: Video explaining how to properly install the fabric. If there is any difficulty with the install watch video for clarification

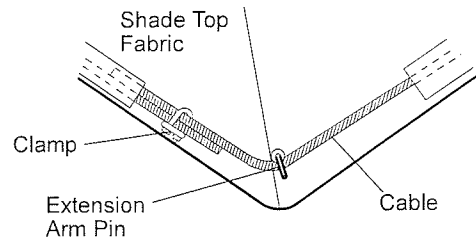


**DETAIL
LOWER ARM ATTACHMENT**



NOTE: Tighten and loosen from BHCS side.

**DETAIL
CABLE CLAMP ATTACHMENT**





PlayBooster® 154884 CoolToppers® Single Post

Parts List

Part#	Description	Qty.
152833	Umbrella Ext. Arm Weldt., Specify Color.....	4
210962	LSI Shade 12x12 Cooltopper	1
153560	Clamp, Specify Color	2
153663	Brace (Installation & Removal), Specify Color	4
175824	Single Post Shade Hardware Package	1
100322	1/2" Standard Hex Nut, SST	8
100323	5/8" Standard Hex Nut, SST	8
100327	3/8" Standard Hex Nut, SST	8
100365	3/8" SAE Flat Washer, SST	16
100366	5/8" Flat Washer, SST	8
175652	5/8" Lock Washer, SST	8
127547	3/8" x 1 1/8" BHCS w/Pin, SST.....	8
127551	5/8" x 1 1/2" BHCS w/Pin, SST.....	8

DB=Direct Bury

Specifications

CoolToppers Shade Top: High-density polyethylene with ultra violet additives. All corners to be strengthened with 16 oz. non-tear vinyl material. Protective webbing is sewn into all areas where steel cable enters/exits cloth pockets. Live loads 20 psf. Wind design speed withstands up to 90 mph. Uplift 19 psf. Snow loads 5 psf. Tear strength warp 221 lb. and weft 463 lb.. Burst strength 38 PSIA.

Extension Arms: Weldment comprised of 2.875" O.D. RS-40 (.149" - .182") galvanized steel tubing, 1/4" steel plate and 1/4" diameter carbon steel J-hooks. Finish: ProShield®, color specified.

Clamp: Weldment comprised of 1/4" x 3" HRPO flat steel and 1/4" HRPO steel plate. Finish: ProShield, color specified.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

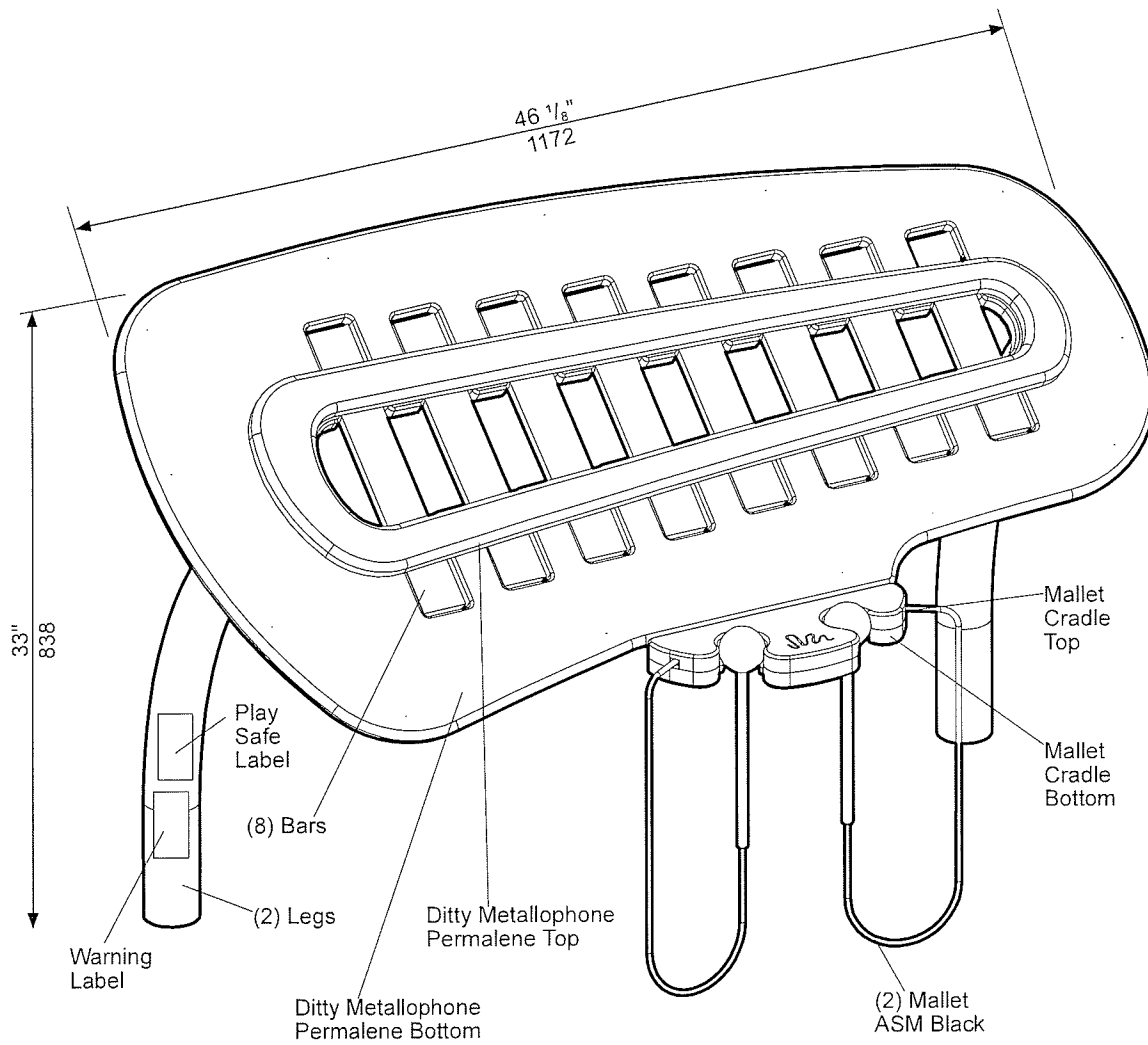
Installation Time: Approx. 10 Hours
Actual Size: 12' x 12'
Weight: 145 lbs.

Installation Instructions

NOTE: Allow concrete footing to cure for a minimum of 72 hours before installing CoolToppers shade top.

- 1) Attach clamps to post at height shown using 3/8" x 1 1/8" BHCS w/pin with 3/8" SAE flat washers and 3/8" standard hex nuts with 3/8" SAE flat washers. Refer to the Upper Arm Attachment Detail. **NOTE:** *Orientate clamp flanges in the direction you want extension arms to face.*
- 2) Lift extension arm into position and attach the top bolt only to clamp flange, using 5/8" x 1 1/2" BHCS w/pin with 5/8" flat washer and 5/8" standard hex nut with 5/8" lock washer. Attach remaining extension arms following the same sequence. Refer to the Upper Arm Attachment Detail. **NOTE:** *Lightly tighten bolts, so arms move freely up and down. For ease of installation a 12'-16' ladder or bucket lift is recommended.*
- 3) Lift extension arm up and attach temporary brace to clamp flange and extension arm using 1/2" standard hex nuts. Attach temporary braces to remaining extension arms following the same sequence. Refer to the Brace Attachment Detail.
- 4) Place the shade over the extension arms and attach each corner to extension arm pin.
- 5) Remove temporary braces from extension arms and clamps. **NOTE:** *Retain temporary braces for future use.*
- 6) Simultaneously pull the arms down and bolt the remaining hole in the arm to post flange using 5/8" x 1 1/2" BHCS w/pin with 5/8" flat washers and 5/8" standard hex nuts with 5/8" lock washers. Refer to the Lower Arm Attachment Detail. Final tighten hardware. **NOTE:** *When CoolToppers shade top is properly tensioned, it should be difficult to insert fingers between fabric and top of post. To increase tension to shade top, loosen clamp fasteners and pull down on extension arms and clamps. Retighten clamp fasteners.*
- 7) Thread cable along perimeter of fabric.
- 8) Cable should lay on top of fabric at the corners. Pull cable tight by hand and attach with cable clamp provided. Refer to the Cable Clamp Attachment Detail.

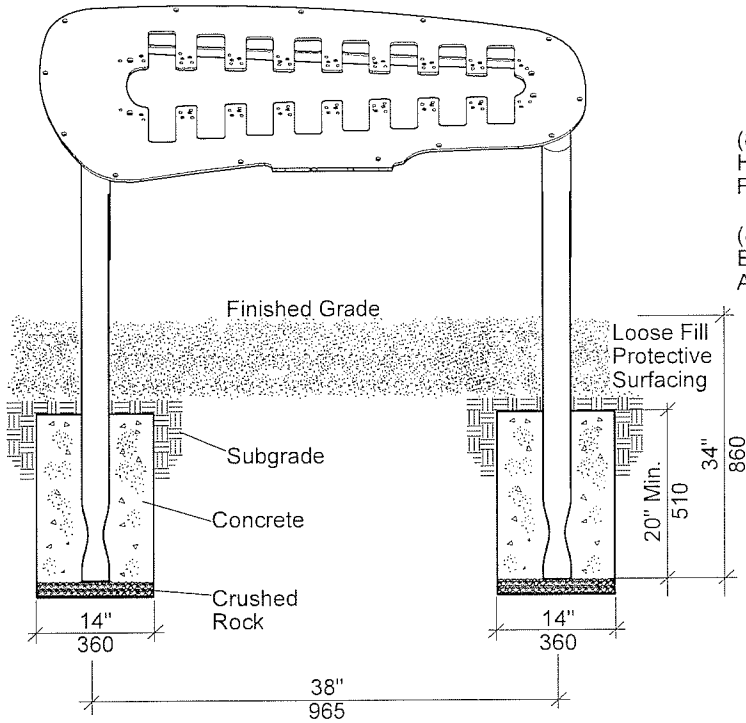
ECO 0110949 Document 35527000 replaces 30846800. Update instructions steps and time.



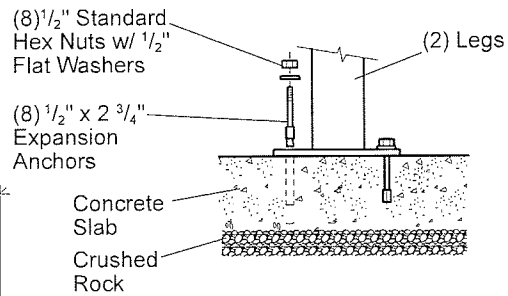
Sensory Play

228212 Ditty™ Metallophone

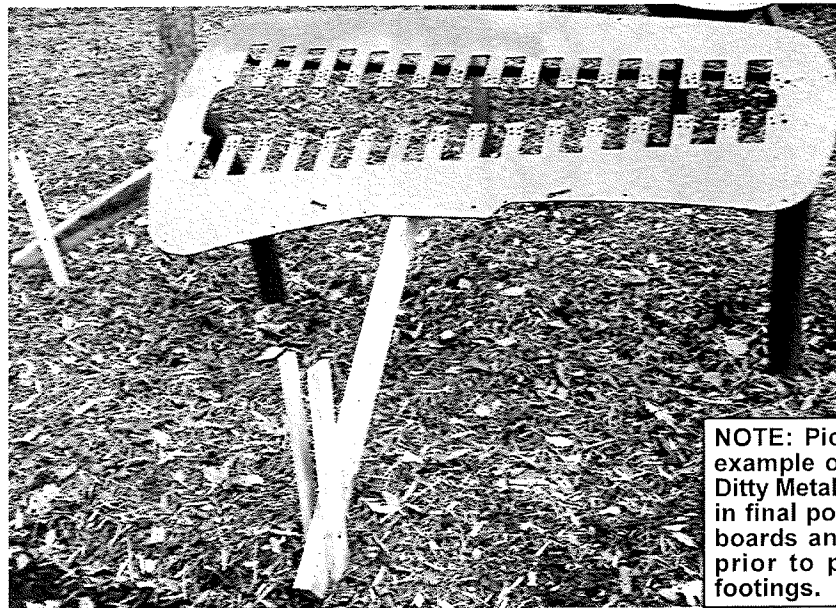
DETAIL
DIRECT BURY



DETAIL
SURFACE MOUNT



DETAIL
PROPPED IN FINAL POSITION



NOTE: Picture shown is an example of how to prop the Ditty Metallophone assembly in final position, using 2 x 4 boards and wooden stakes, prior to pouring concrete footings.

Sensory Play

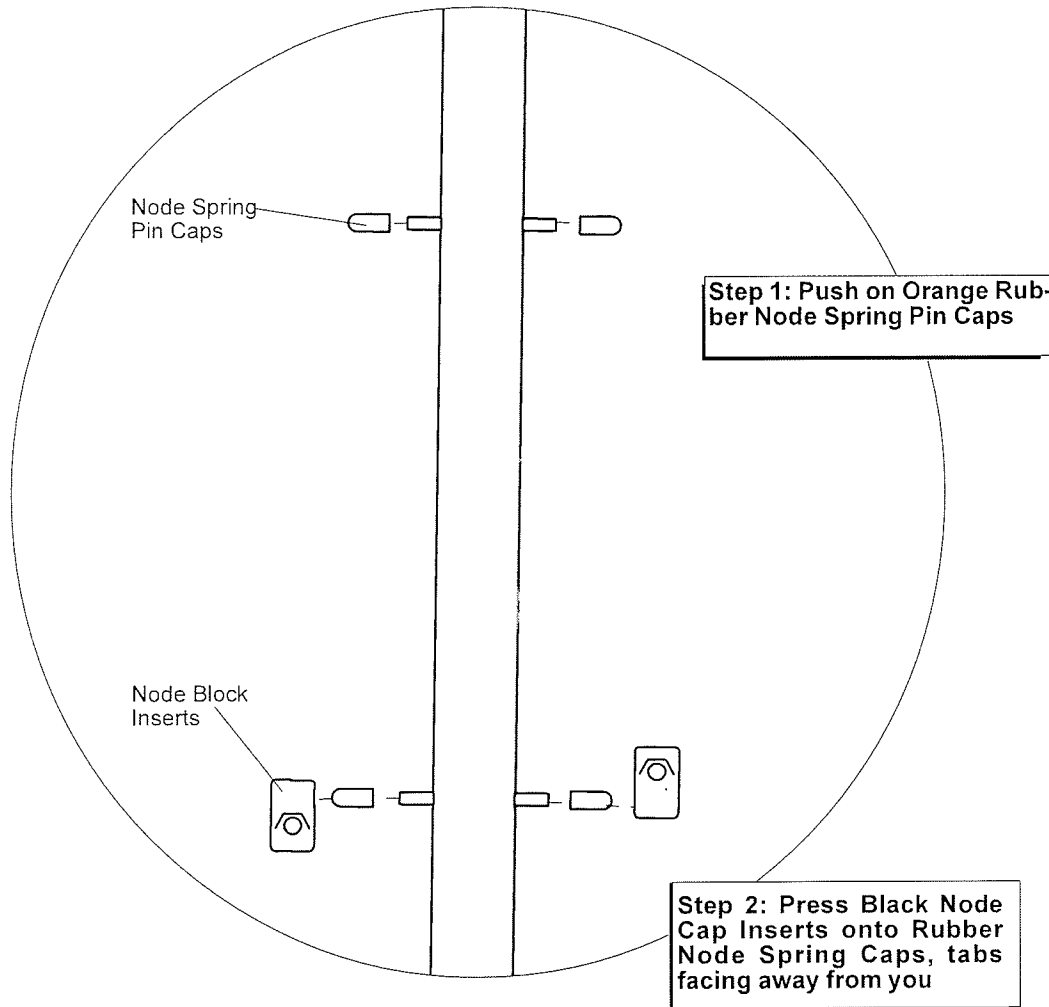
228212 Ditty™ Metallophone

Page 2 of 7

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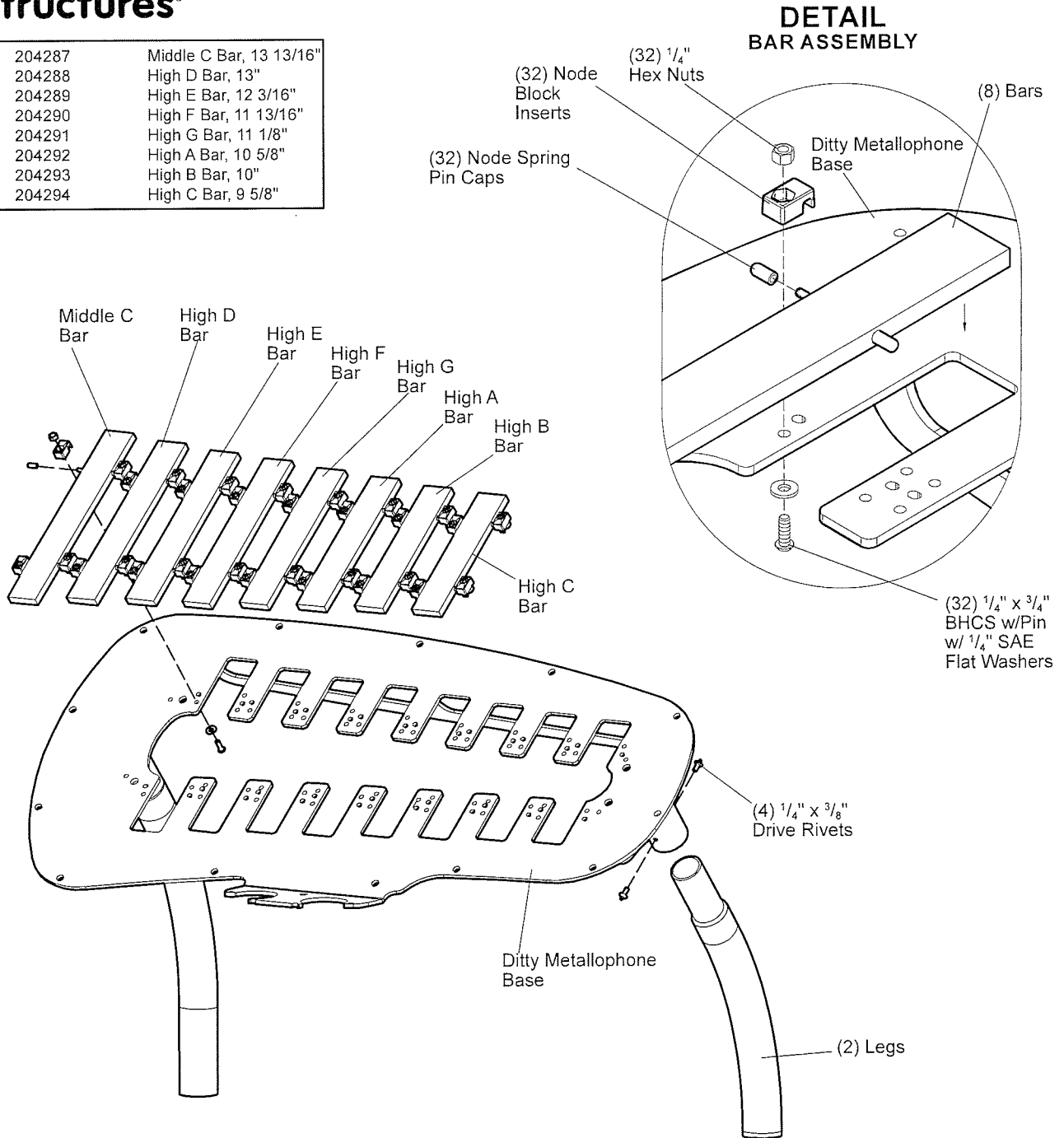
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DETAIL
PRE-ASSEMBLE TUBE MOUNTS



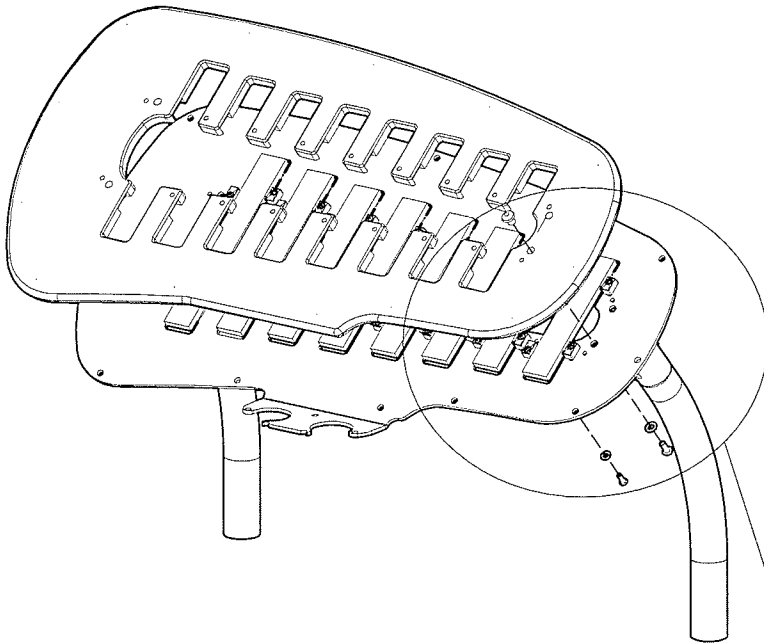
Once pre-assembled, the tubes fit their corresponding size locations with the plastic pin caps fitting in each oval hole. This will self-align the node block inserts for the bolt connections.

204287	Middle C Bar, 13 13/16"
204288	High D Bar, 13"
204289	High E Bar, 12 3/16"
204290	High F Bar, 11 13/16"
204291	High G Bar, 11 1/8"
204292	High A Bar, 10 5/8"
204293	High B Bar, 10"
204294	High C Bar, 9 5/8"

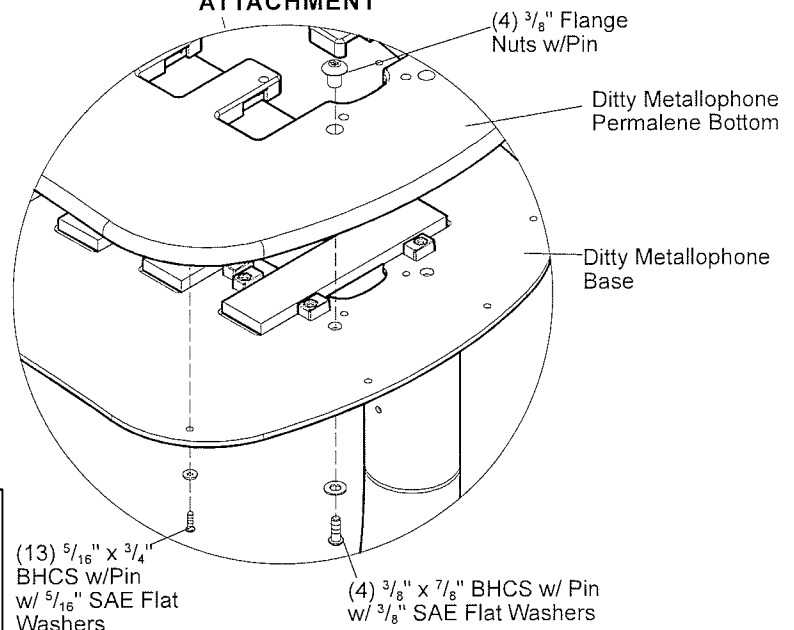


NOTE: Assembly shown has been rotated for clarity.

NOTE: Assembly shown has been rotated for clarity.



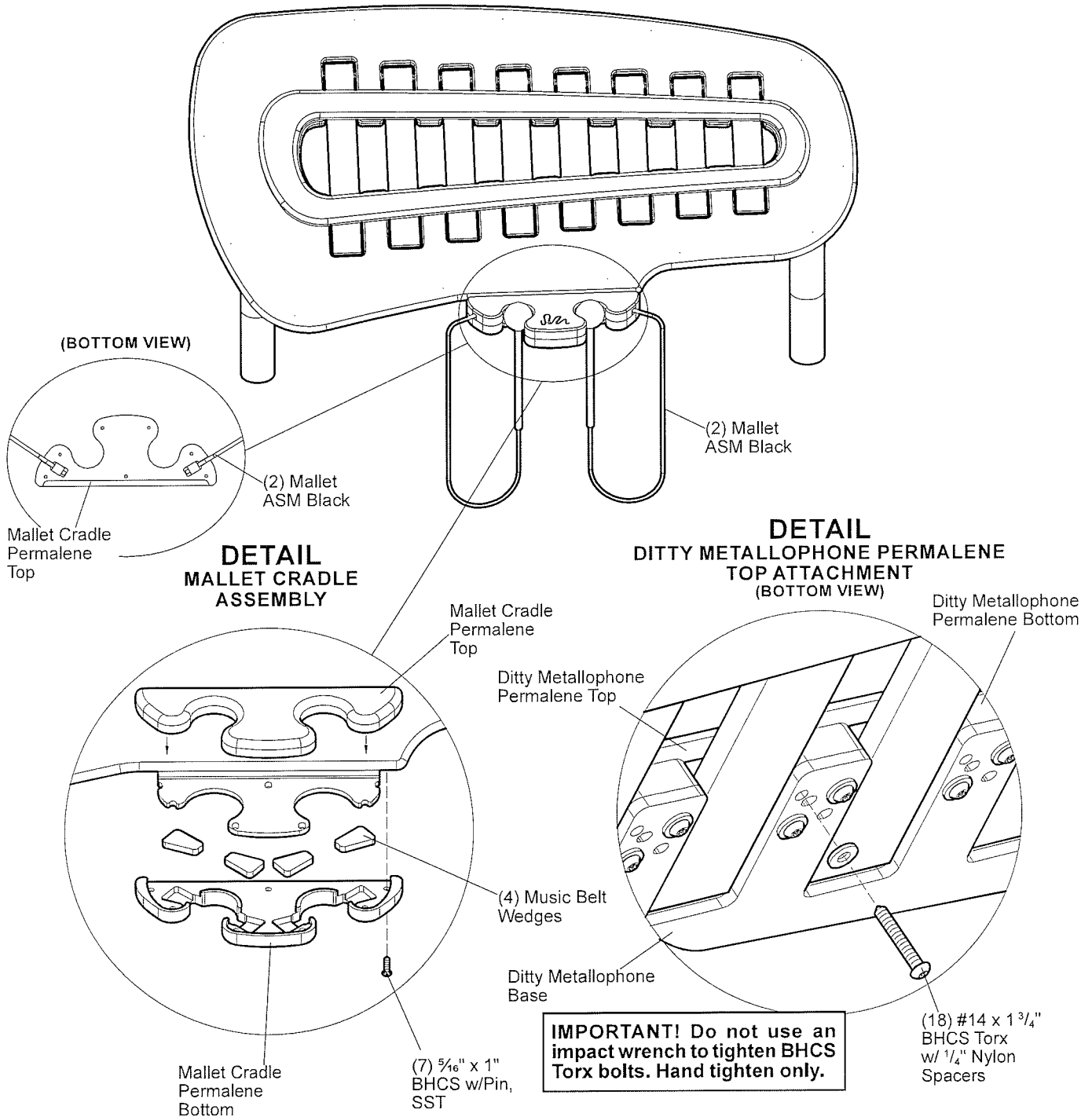
**DETAIL
PERMALENE BOTTOM
ATTACHMENT**



IMPORTANT! Do not use an impact wrench to tighten BHCS Torx bolts. Hand tighten only.

(13) $\frac{5}{16}$ " x $\frac{3}{4}$ " BHCS w/Pin w/ $\frac{5}{16}$ " SAE Flat Washers

(4) $\frac{3}{8}$ " x $\frac{7}{8}$ " BHCS w/ Pin w/ $\frac{3}{8}$ " SAE Flat Washers



Sensory Play

228212 Ditty™ Metallophone



Sensory Play 228212 Ditty™ Metallophone

Parts List

Part#	Description	Qty.
227381	Ditty Metallophone Base, Specify Color.....	1
227389	Ditty Metallophone Permalene Bottom, Specify Color 1	1
227393	Ditty Metallophone Permalene Top, Specify Color.....	1
228511	Metallophone Leg, (DB), Specify Color.....	2
227468	Metallophone Leg, (SM), Specify Color.....	2
268146	Mallet Cradle Permalene Top, Specify Color.....	1
268148	Mallet Cradle Permalene Bottom, Specify Color.....	1
228505	Ditty Chimes Kit	1
204287	Middle C Bar, 13 13/16"	1
204288	High D Bar, 13"	1
204289	High E Bar, 12 3/16"	1
204290	High F Bar, 11 13/16"	1
204291	High G Bar, 11 1/8"	1
204292	High A Bar, 10 5/8"	1
204293	High B Bar, 10"	1
204294	High C Bar, 9 5/8"	1
220677	Mallet Assembly, Black.....	2
268170	Ditty™/Jingle™ Chimes Hardware Package	1
211443	Node Block w/Insert.....	32
162374	1/4" x 3/4" BHCS w/Pin, SST.....	32
100364	1/4" SAE Flat Washer, SST.....	32
212291	Node Spring Pin Cap.....	32
228545	Music Belt Wedge.....	4
264971	5/16" x 1" BHCS w/Pin, SST.....	7
216762	#14 x 1 3/4" BHCS (Torx), SST.....	18
100365	3/8" SAE Flat Washer, SST.....	4
100196	3/8" x 7/8" BHCS (Torx), SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	4
216777	1/4" Hex Nut, SST.....	32
127463	T-27 TPP Hex Bit (Torx), SST.....	1
100611	1/4" x 3/8" Drive Rivet, AL/SST.....	4
230884	1/4" Nylon Spacers.....	18
223807	5/16" x 3/4" BHCS w/Pin, SST.....	13
223956	5/16" SAE Flat Washer.....	13
156845	Play Safe Label, 2-5 Yrs.....	1
183064	Warning Label.....	1
121348	4-Hole Surface Mount Hardware Package	2
100266	1/2" x 2 3/4" Standard Hex Nut, SST.....	8
100322	1/2" Standard Hex Nut, SST.....	8
100363	1/2" Flat Washer, SST.....	8

DB = Direct Bury
SM = Surface Mount

Specifications

Bar Base:	Weldment comprised of 3.500" (88.9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing, and 1/4" (6,35 mm) thick HRPO steel sheet. Finish: ProShield®, color specified.
Bar Top & Bottom:	Permalene®, color specified.
Leg:	Weldment comprised of 3.500" (88.9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing. Finish: ProShield®, color specified.
Bars:	Made from 1/2" (12,7 mm) thick x 2" (50,8 mm) wide aluminum.
Cradle Top & Bottom:	Permalene®, color specified.

Specifications are subject to change without notice.
PLAYGROUND CUT SHEETS

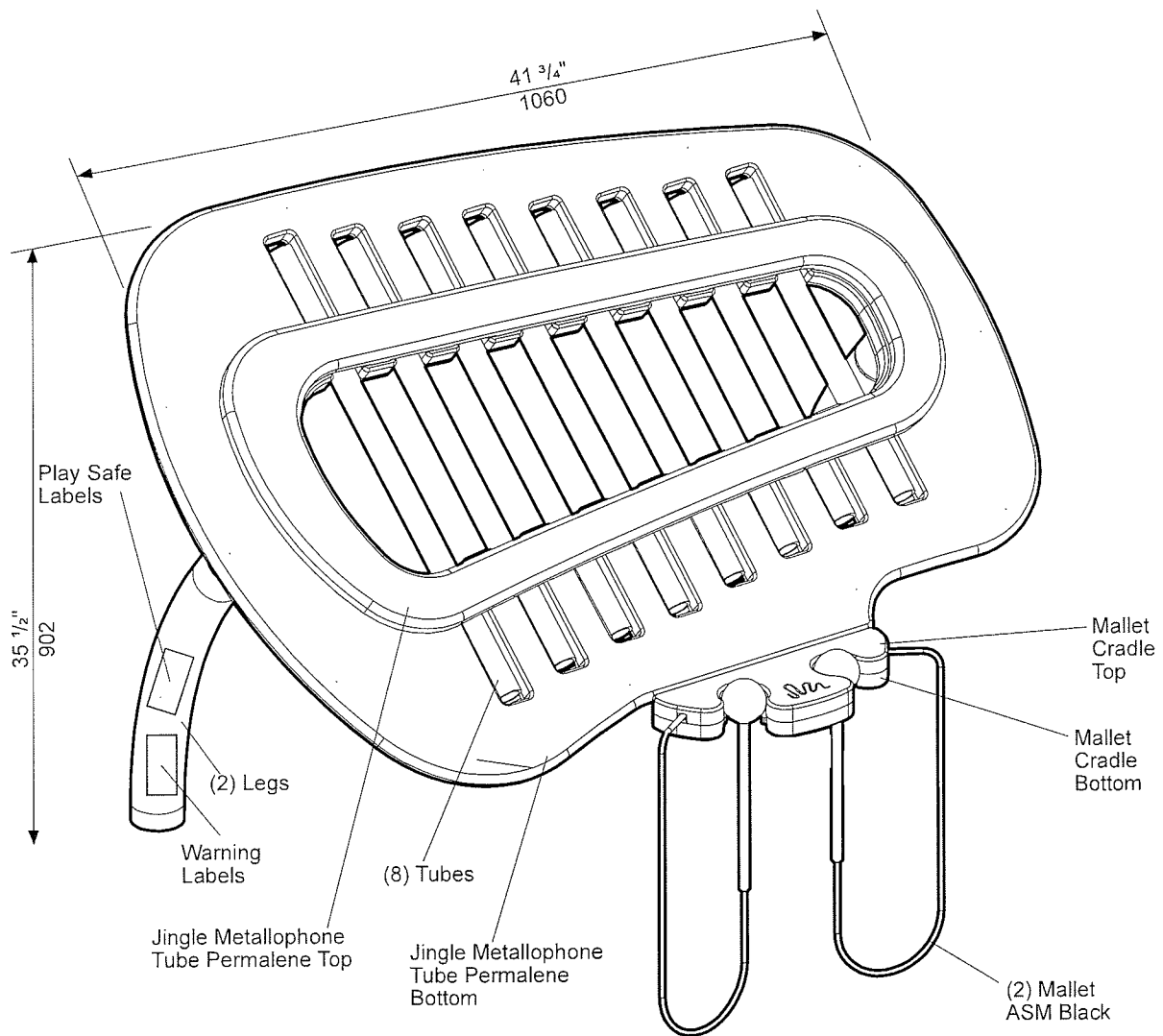
Mallet: Comprised of 2" (50,8 mm) diameter grey & black polyurethane, 1/2" (12,7 mm) diameter aluminum handle and 3/16" (4,74 mm) diameter stainless steel cable with nylon coating.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: DB - Approx. 6 man hours
SM - Approx. 4 man hours
Concrete Req.: DB - Approx. 3.56 cu. ft.
Weight: DB - 127 lbs.
SM - 120 lbs.

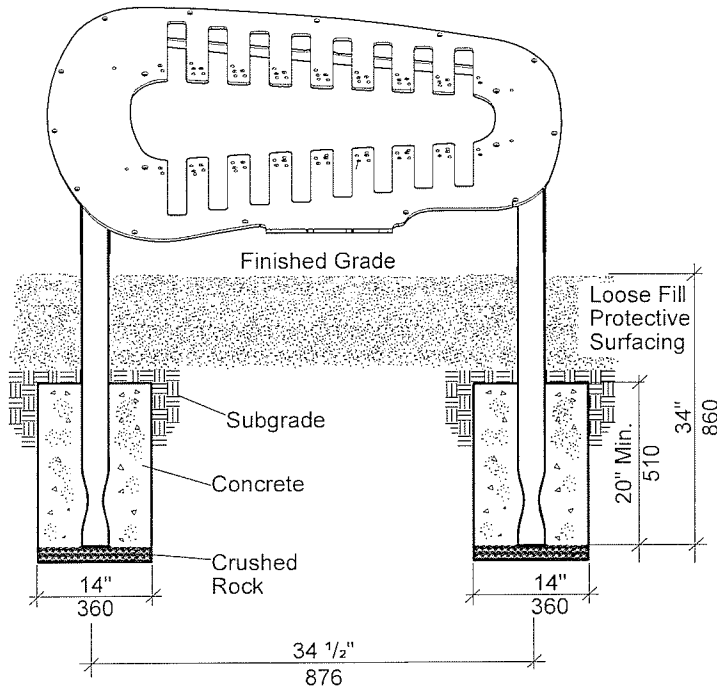
Installation Instructions

- (Direct Bury)** Dig footings as shown.
- Insert metallophone legs into bar base tubes. Measurement from center to center of each leg should be 38" (1663 mm). With legs in correct position, drill through holes in bar base tubes and into metallophone legs with a 1/4" or "F" (only) drill bit. Insert 1/4" x 3/8" drive rivets into holes and hammer rivet pins in until flush with head. Refer to sheet 2.
- (Direct Bury)** Place metallophone legs into footing holes. With metallophone legs propped in plumb and final position, pour concrete footings. Allow concrete footings to cure for a minimum of 24 hours before completing assembly. **NOTE:** See back of sheet 1 for an example of Ditty Metallophone assembly propped in final position.
(Surface Mount) With metallophone legs in plumb position, drill 1/2" x 3" deep holes through metallophone leg plates using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Fasten metallophone leg plates to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
- Place node spring caps on each end of bar pins. Attach bars and mallets to bar base as shown. Refer to the Bar Assembly Detail.
- Attach Ditty metallophone Permalene bottom to Ditty metallophone base. Refer to the Permalene® Bottom Attachment Detail.
- Attach mallet cradles to Ditty metallophone base, as shown. Refer to the Mallet Cradle Assembly Detail.
- Attach Ditty metallophone Permalene top to metallophone base, as shown. Refer to the Ditty metallophone Permalene Top Attachment Detail.
- Apply labels as shown.

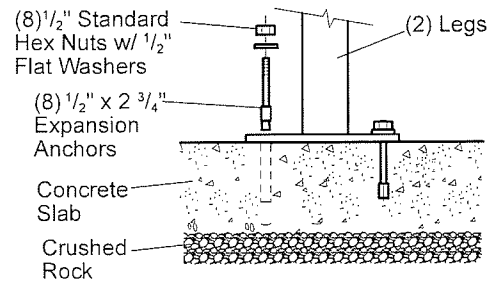


Sensory Play 228213 Jingle™ Metallophone

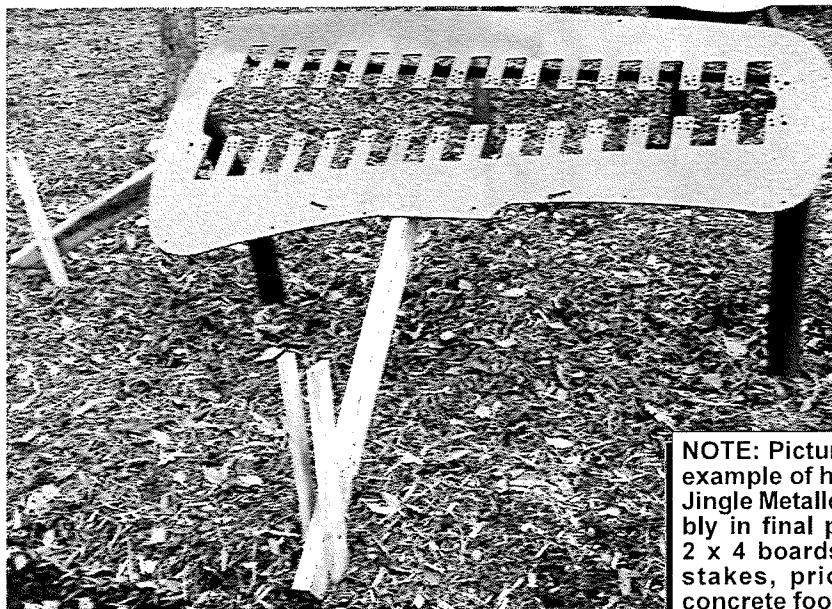
**DETAIL
DIRECT BURY**



**DETAIL
SURFACE MOUNT**



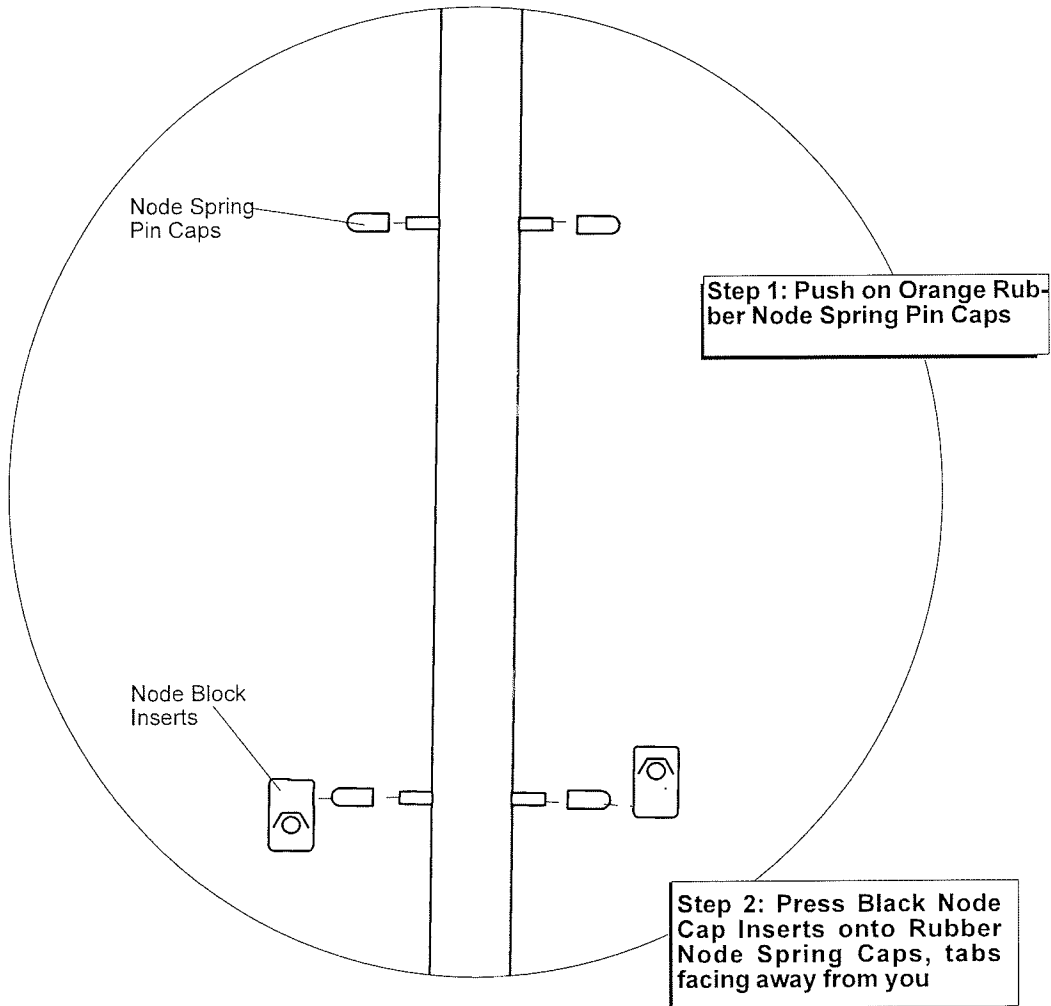
**DETAIL
PROPPED IN FINAL POSITION**



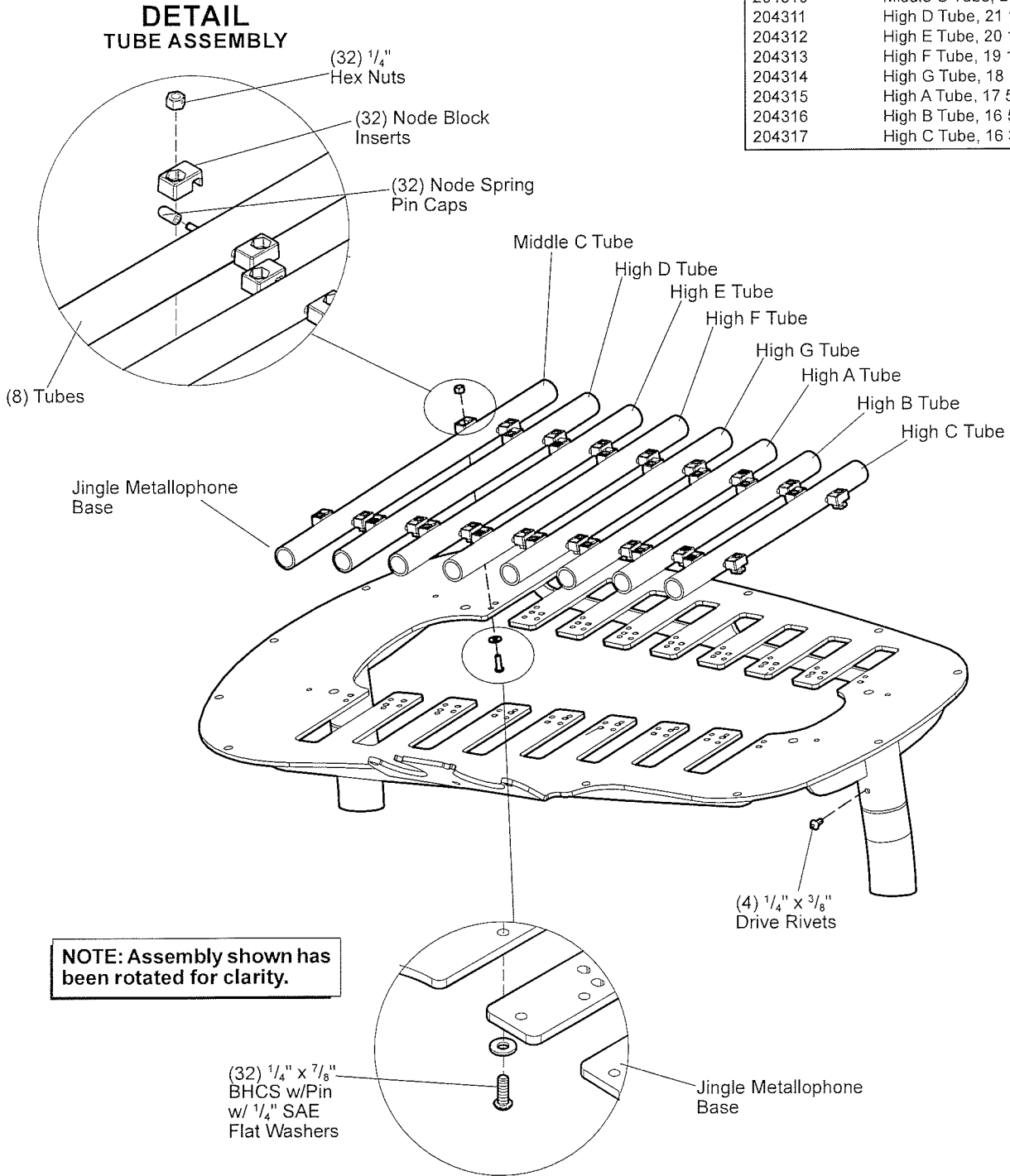
NOTE: Picture shown is an example of how to prop the Jingle Metallophone assembly in final position, using 2 x 4 boards and wooden stakes, prior to pouring concrete footings.

Sensory Play 228213 Jingle™ Metallophone

DETAIL
PRE-ASSEMBLE TUBE MOUNTS



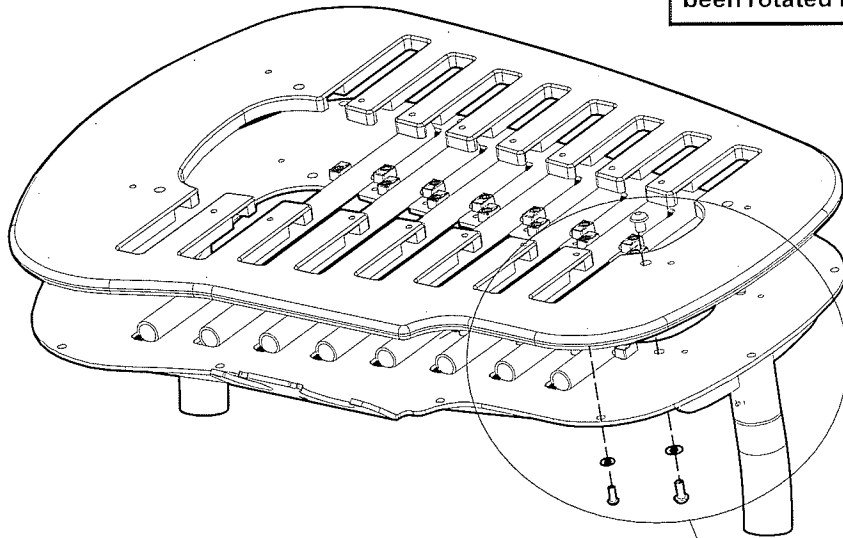
Once pre-assembled, the tubes fit their corresponding size locations with the plastic pin caps fitting in each oval hole. This will self-align the node block inserts for the bolt connections.



204310	Middle C Tube, 23"
204311	High D Tube, 21 11/16"
204312	High E Tube, 20 1/2"
204313	High F Tube, 19 13/16"
204314	High G Tube, 18 11/16"
204315	High A Tube, 17 5/8"
204316	High B Tube, 16 5/8"
204317	High C Tube, 16 3/16"

Sensory Play 228213 Jingle™ Metallophone

NOTE: Assembly shown has been rotated for clarity.

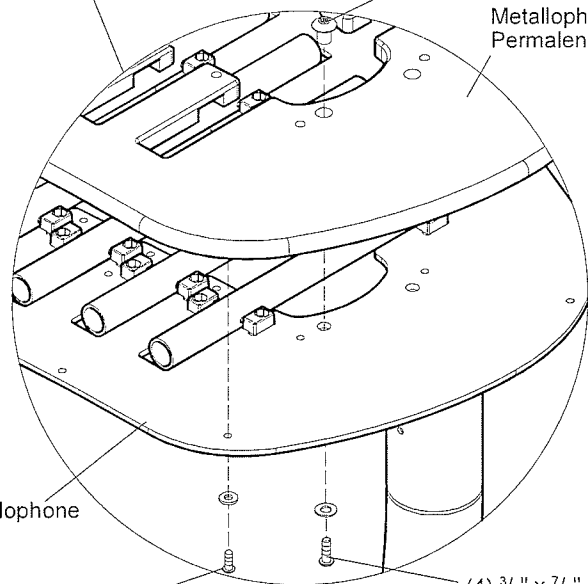


**DETAIL
PERMALENE BOTTOM
ATTACHMENT**

(4) 3/8" Flange Nuts w/Pin

Metallophone Jingle Permalene Bottom

IMPORTANT! Do not use an impact wrench to tighten BHCS Torx bolts. Hand tighten only.

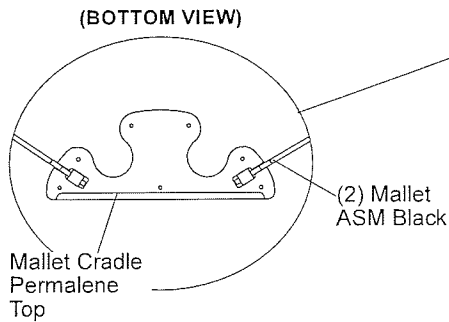
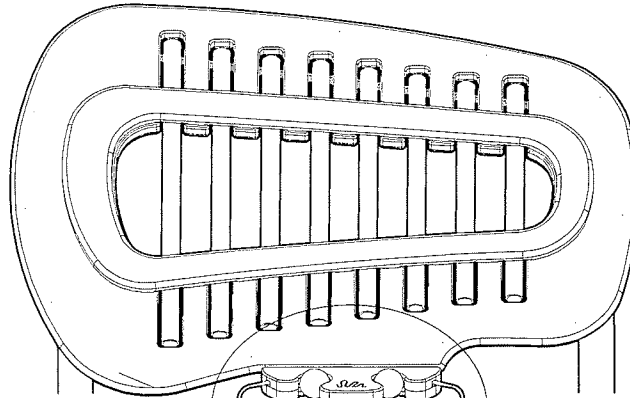


Jingle Metallophone Base

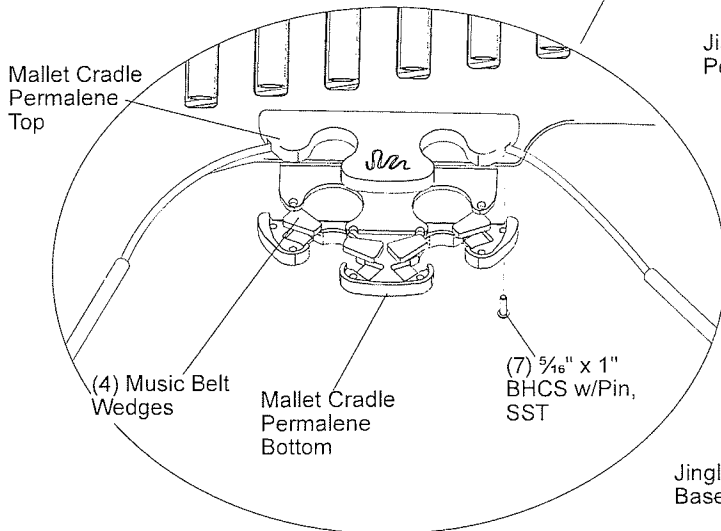
(13) 5/16" x 3/4" BHCS w/ 5/16" SAE Washers

(4) 3/8" x 7/8" BHCS w/ Pin w/ 3/8" SAE Flat Washers

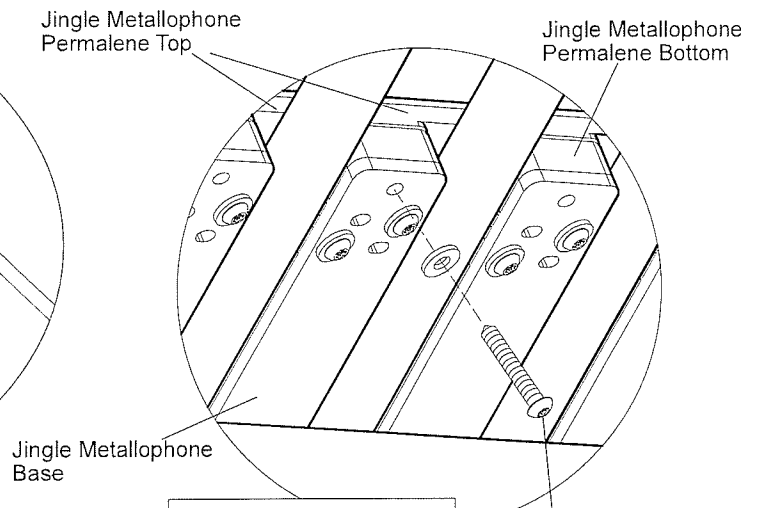
Sensory Play 228213 Jingle™ Metallophone



**DETAIL
MALLET CRADLE
ASSEMBLY**



**DETAIL
JINGLE METALLOPHONE PERMALENE
TOP ATTACHMENT
(BOTTOM VIEW)**



IMPORTANT! Do not use an impact wrench to tighten BHCS Torx bolts. Hand tighten only.

(18) #14 x 1 3/4"
BHCS Torx
w/ 1/4" Nylon
Spacers

Sensory Play 228213 Jingle™ Metallophone

Sensory Play 228213 Jingle™ Metallophone

Parts List

Part#	Description	Qty.
227579	Jingle Metallophone Base, Specify Color.....	1
227571	Jingle Metallophone Permalene Bottom, Specify Color.....	1
227575	Jingle Metallophone Permalene Top, Specify Color.....	1
228511	Metallophone Leg, (DB), Specify Color.....	2
227468	Metallophone Leg, (SM), Specify Color.....	2
268146	Mallet Cradle Permalene Top, Specify Color.....	1
268148	Mallet Cradle Permalene Bottom, Specify Color.....	1
228506	Jingle™ Chimes Kit	1
204310	Middle C Tube, 23".....	1
204311	High D Tube, 21 11/16".....	1
204312	High E Tube, 20 1/2".....	1
204313	High F Tube, 19 13/16".....	1
204314	High G Tube, 18 11/16".....	1
204315	High A Tube, 17 5/8".....	1
204316	High B Tube, 16 5/8".....	1
204317	High C Tube, 16 3/16".....	1
220677	Mallet Assembly, Black.....	2
268170	Ditty™, Jingle™ Chimes Hardware Package	1
211443	Node Block w/Insert.....	32
162374	1/4" x 3/4" BHCS w/Pin, SST.....	32
100364	1/4" SAE Flat Washer, SST.....	32
212291	Node Spring Pin Cap.....	32
228545	Music Belt Wedge.....	4
216762	#14 x 1 3/4" BHCS (Torx), SST.....	18
100365	3/8" SAE Flat Washer, SST.....	4
100196	3/8" x 7/8" BHCS (Torx), SST.....	4
100353	3/8" Flange Nut w/Pin, SST.....	4
216777	1/4" Hex Nut, SST.....	32
127463	T-27 TPP Hex Bit (Torx), SST.....	1
100611	1/4" x 3/8" Drive Rivet, AL/SST.....	4
230884	1/4" Nylon Spacers.....	18
223807	5/16" x 3/4" BHCS w/Pin, SST.....	13
223956	5/16" SAE Flat Washer, SST.....	13
156845	Play Safe Label, 2-5 Yrs.....	1
183064	Warning Label.....	1
264971	5/16" x 1" BHCS w/Pin, SST.....	7
121348	4-Hole Surface Mount Hardware Package	2
100266	1/2" x 2 3/4" Standard Hex Nut, SST.....	8
100322	1/2" Standard Hex Nut, SST.....	8
100363	1/2" Flat Washer, SST.....	8

DB = Direct Bury

SM = Surface Mount

Specifications

Tube Base:	Weldment comprised of 3.500" (88,9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing, and 1/4" (6,35 mm) thick HRPO steel sheet. Finish: ProShield®, color specified.
Bar Top & Bottom:	Permalene®, color specified.
Leg:	Weldment comprised of 3.500" (88,9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing. Finish: ProShield®, color specified.
Tubes:	Made from 1.250" (31,75 mm) diameter (.125")(3,17 mm) wall aluminum tube.
Cradle Top & Bottom:	Permalene®, color specified.

Mallet: Comprised of 2" (50,8 mm) diameter black polyurethane, 1/2" (12,7 mm) diameter aluminum handle and 3/16" (4,74 mm) diameter stainless steel cable with nylon coating.

Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).

Installation Time: DB - Approx. 6 man hours

SM - Approx. 4 man hours

Concrete Req.: Approx. 3.56 cu. ft.

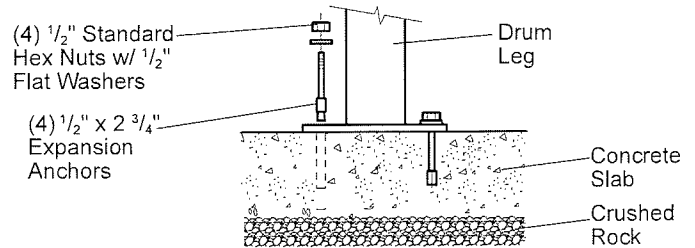
Weight: DB - 131 lbs.

SM - 123 lbs.

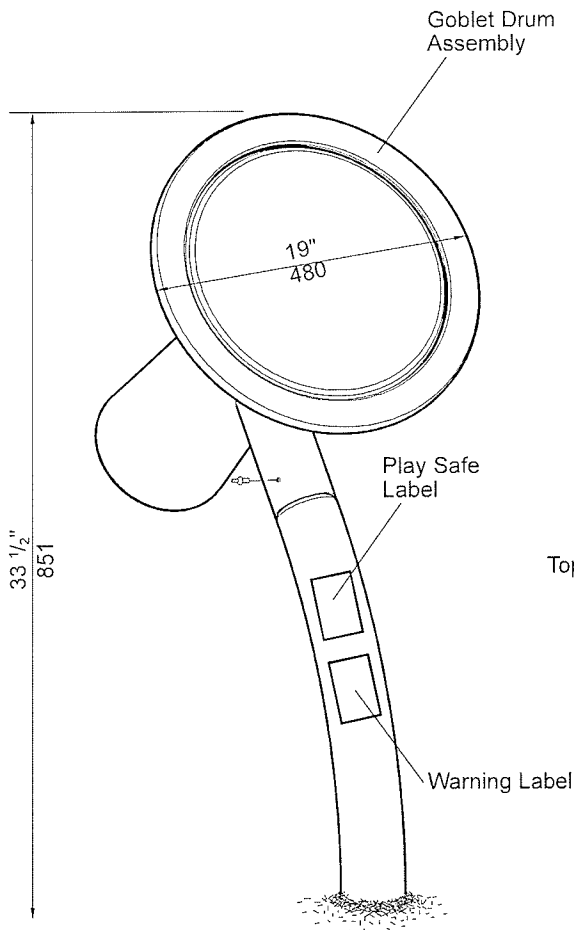
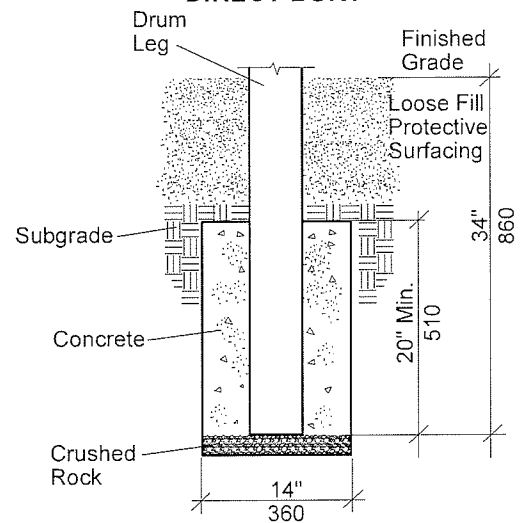
Installation Instructions

- (Direct Bury)** Dig footings as shown.
- Insert metallophone legs into bar base tubes. Measurement from center to center of each leg should be 34 1/2" (1500 mm). With legs in correct position, drill through holes in bar base tubes and into metallophone legs with a 1/4" or "F" (only) drill bit. Insert 1/4" x 3/8" drive rivets into holes and hammer rivet pins in until flush with head. Refer to sheet 2.
- (Direct Bury)** Place metallophone legs into footing holes. With metallophone legs propped in plumb and final position, pour concrete footings. Allow concrete footings to cure for a minimum of 24 hours before completing assembly. **NOTE:** See back of sheet 1 for an example of Jingle Metallophone assembly propped in final position.
(Surface Mount) With metallophone legs in plumb position, drill 1/2" x 3" deep holes through metallophone leg plates using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Fasten metallophone leg plates to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
- Place node spring caps on each end of tube pins. Attach tubes and mallets to tube base as shown. Refer to the Tube Assembly Detail.
- Attach Jingle metallophone Permalene bottom to tube base. Refer to the Permalene® Bottom Attachment Detail.
- Attach mallet cradles to cradle bracket, as shown. Refer to the Mallet Cradle Assembly Detail.
- Attach metallo bar Permalene top to metallophone tube base, as shown. Refer to the Metallo Tube Permalene Top Attachment Detail.
- Apply labels as shown.

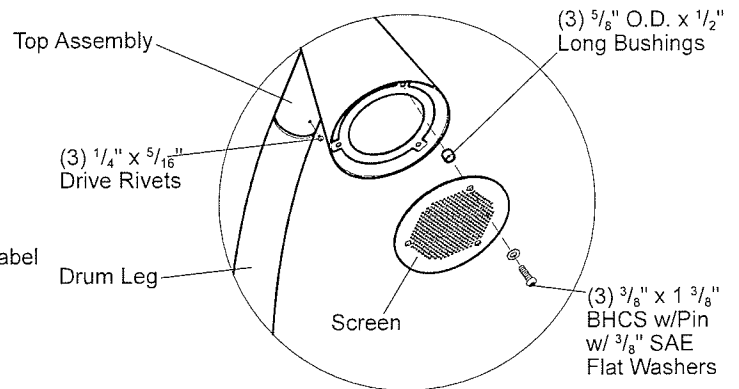
**DETAIL
SURFACE MOUNT**



**DETAIL
DIRECT BURY**



**DETAIL
SCREEN ATTACHMENT**



Sensory Play

228215 Goblet Junior Drum

601 7TH STREET SOUTH, DELANO, MINNESOTA 55328-8605 888-574-4678 LSI Install Help 888-438-6574 LSI Direct 763-972-5200 Int. FAX (763) 972-3185

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Document #32910300



Sensory Play 228215 Goblet Junior Drum

Parts List

Part#	Description	Qty.
228251	Drum Leg, (DB), Specify Color.....	1
228250	Drum Leg, (SM), Specify Color.....	1
279431	Goblet Drum Top Assembly, Specify Color.....	1
210433	8" Drum Screen, Specify Color.....	1
329155	Goblet/Kundu Drum Hardware Package	1
113027	3/8" x 1 3/8" BHCS w/Pin, SST.....	3
100365	3/8" SAE Flat Washer, SST.....	3
156962	3/8" O.D. x 1/2" Long, SST.....	3
127155	1/4" x 5/16" Drive Rivet, AL/SST.....	3
156845	Play Safe Label.....	1
183064	Warning Label.....	1
121348	4-Hole Surface Mount Hardware Package	1
100266	1/2" x 2 3/4" Standard Hex Nut, SST.....	4
100322	1/2" Standard Hex Nut, SST.....	4
100363	1/2" Flat Washer, SST.....	4

DB = Direct Bury
SM = Surface Mount

Specifications

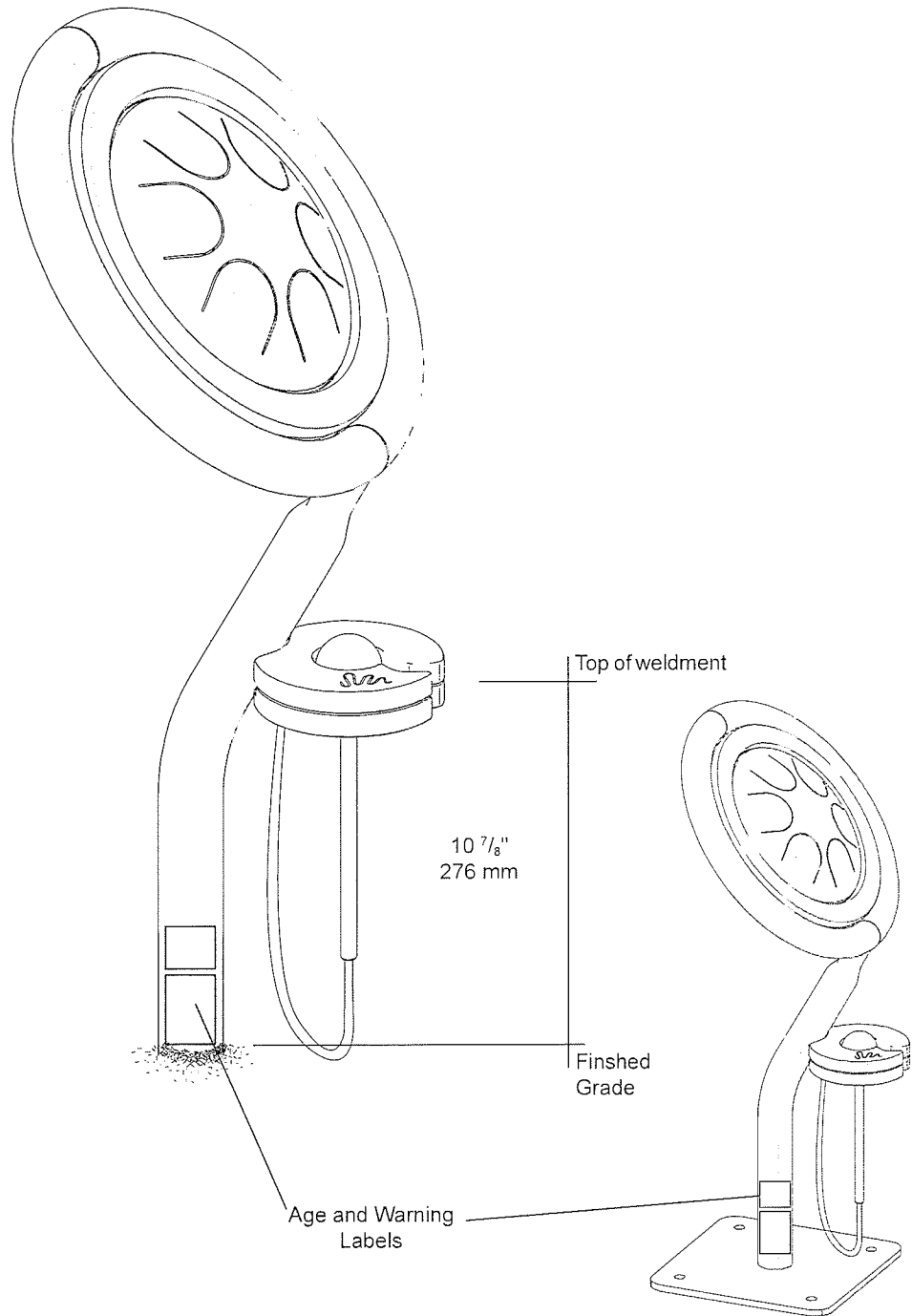
Drum Leg:	Made from 3.500" (88,9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing. Finish: ProShield®, color specified.
Top Assembly:	Weldment comprised of 3.500" (88,9 mm) O.D. RS20 (.125")(3,17 mm) wall galvanized steel tubing, 11 GA. (.120")(3,05 mm) flat steel and 1/8" (3,17 mm) thick HRPO steel sheet. Finish: ProShield®, color specified.
Trim:	Permalene®, color specified.
Screen:	Made from 11 GA. (.125")(3,17 mm) thick aluminum sheet. Finish: ProShield®, color specified.
Drum Head:	Translucent, UV stabilized polycarbonate with a matte textured surface on one side.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
Installation Time:	DB - Approx. 3 man hours SM - Approx. 2 1/2 man hours
Concrete Req.:	DB - Approx. 1.78 cu. ft.
Weight:	DB - 55 lbs. SM - 49 lbs.

Installation Instructions

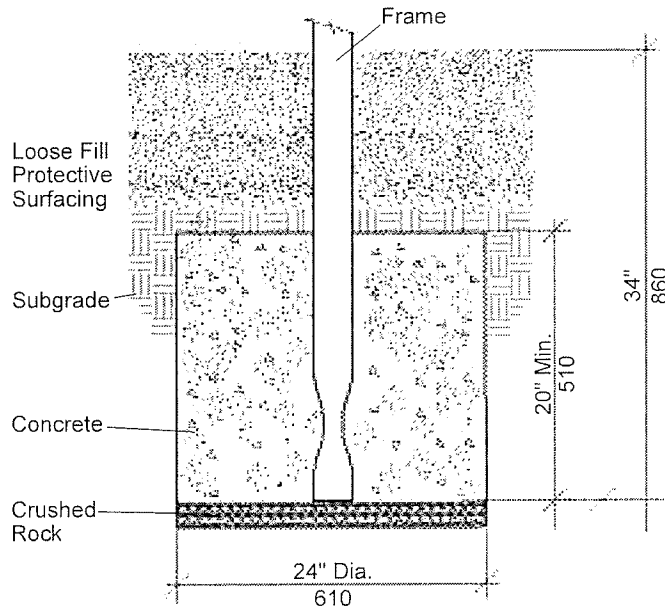
- 1) **(Direct Bury)** Dig footing as shown.
- 2) **(Direct Bury)** With lower portion of drum leg plumb and in final position, pour concrete footing. Allow concrete footing to cure for a minimum of 24 hours before attaching drum assembly, drum head and trim to drum leg.
(Surface Mount) Drill 1/2" x 3" deep holes through drum mount post plate using hammer drill and 1/2" masonry bit. Tap expansion anchors into drilled holes. Fasten drum mount post plate to expansion anchors using 1/2" standard hex nuts with 1/2" flat washers.
- 3) Place drum onto leg. Drill through holes in drum assembly and into drum leg with a 1/4" or "F" (only) drill bit. Insert 1/4" x 5/16" drive rivets into holes and hammer rivet pins in until flush with head.
- 4) Attach screen to drum top assembly. Refer to the Screen Attachment Detail.
- 5) Apply labels as shown.

SAFETY NOTE

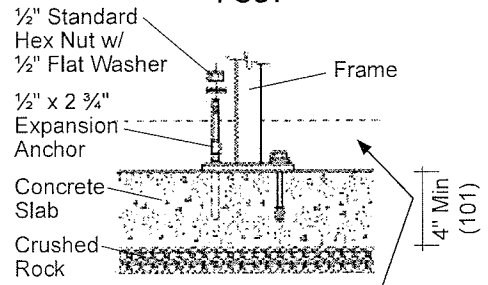
Choose a protective surfacing material that has a Critical Height Value of at least the height of the Highest Accessible Part/Fall Height of the adjacent equipment. (Ref. ASTM F1487.)



**DETAIL
DIRECT BURY**

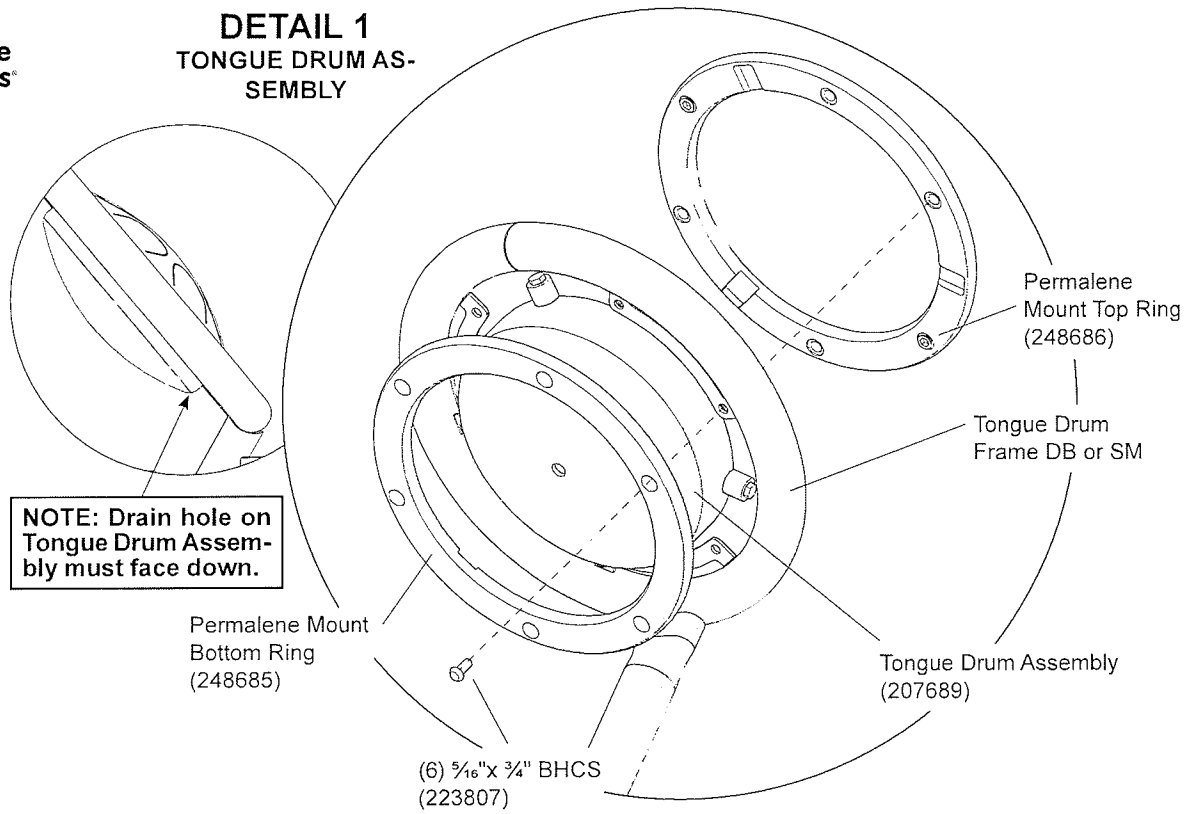


**DETAIL
SURFACE MOUNT
POST**



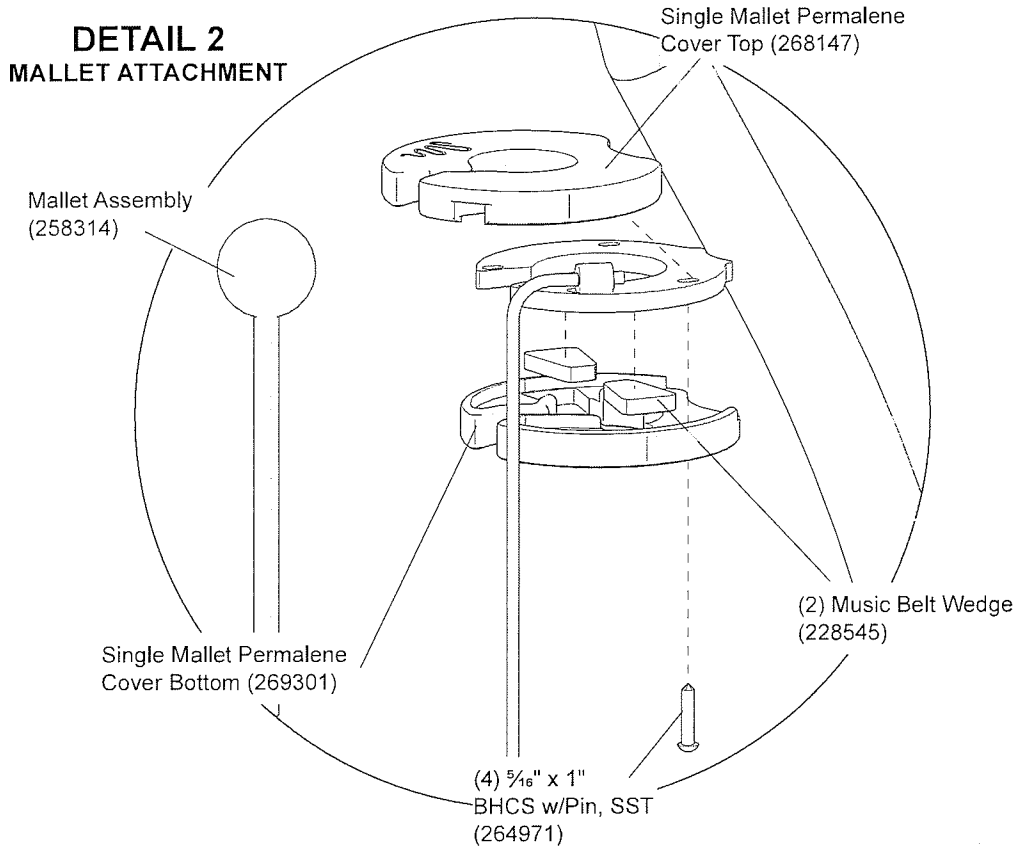
NOTE: Sufficient protective surfacing must cover hardware to satisfy fall height requirements.

DETAIL 1
TONGUE DRUM ASSEMBLY



NOTE: Drain hole on Tongue Drum Assembly must face down.

DETAIL 2
MALLET ATTACHMENT





Rhapsody® 250341 Tongue Drum Junior w/ Mallet

Parts List

Part#	Description	Qty.
207689	Tongue Drum Asm	1
268147	Single Mallet Perm Cover Top, Specify Color.....	1
269301	Single Mallet Perm Cover Bottom, Specify Color.....	1
248604	Tongue Junior Drum Frame DB, Specify Color.....	1
248685	Perm Mount Ring Bottom, Specify Color.....	1
248686	Perm Mount Ring Top, Specify Color.....	1
258314	Mallet ASM 55A Light Gray.....	1
248603	Tongue Junior Drum Frame SM, Specify Color	1
254686	Hdw Pkg 2-5 Label.....	1
156845	2-5 Age Label	1
183064	Warning Label	1
293804	Hdw Pkg Tongue Drum	1
264971	BHCS w/Pin 5/16" x 1", SST.....	4
223807	BHCS 6LP 3/16" -18 x 3/4" SST	6
228545	Music Belt Wedge	2
127463	Bit Hex TPP T27 (Torx)	1
121348	Hdw Pkg 4-Hole SM 1/2-13	1
100266	Exp Anchor 1/2" x 2-3/4" ZP.....	4
100322	Nut Hex STD 1/2-13, SST.....	4
100363	Washer Flat 1/2", SST	4

DB= Direct Bury
SM= Surface Mount

Specifications

Tongue Drum:	Stainless steel.
Fasteners:	Primary fasteners shall be socketed and pinned tamperproof in design, stainless steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications).
Mallet:	Comprised of 2" (50,8 mm) diameter grey or black polyurethane, 1/2" (12,7 mm) diameter aluminum handle and 3/16" (4,74 mm) stainless steel cable with nylon coating.
Permalene:	Recycled permalene, specify color.
Frame:	Weldment comprised of 1,900" (48,26 mm) O.D. RS40 (.120"-.130")(3,00 mm-3,30 mm) wall galvanized steel tubing, 1.660 OD RS40 (.111 - .121) wall galvanized steel tubing and 3/8" (9,52 mm) thick HRPO steel sheet. Finish: ProShield®, color specified.
Installation Time:	Approx. 1 person hours
Weight:	DB 36 lbs. SM 46 lbs.
Concrete:	5.24 Cubic Feet DB

Installation Instructions

- 1) **(Direct Bury)** Dig footing holes. Refer to the Plan View & Direct Bury Details.
 - 2) Assemble Tongue Drum. Refer to Detail 1 and 2.
-
- 1) **(Surface Mount)** With sign in proper position, using 1/2" masonry bit and hammer drill, drill 3" deep holes into concrete slab through holes in post slate. Tap 1/2" x 2 3/4" expansion anchors into holes and secure using 1/2" standard hex nuts with 1/2" flat washers.
 - 2) Assemble Tongue Drum. Refer to Detail 1 and 2.

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Do not start concrete production until data has been reviewed and approved by the engineer.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
 - 4. Admixtures.
 - 5. Curing materials.
 - 6. Floor and slab treatments.
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
 - 4. Admixtures.
 - 5. Curing materials.
 - 6. Floor and slab treatments.

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7. Vapor retarders.
8. Epoxy joint filler.
9. Joint-filler strips.
10. Repair materials.
11. Form liners
12. Reglets
13. Vapor retarder/barrier

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548. Contractor shall provide a storage box for concrete cylinders.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials." CRSI
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

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- B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- C. All hooks, unless otherwise noted, shall conform to "ACI Standard Hooks".
- D. Tie-wire shall not be less than 16 gauge wire

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I/II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Nominal Maximum Aggregate Size: 3/4 inch.
- C. Fly Ash : ASTM C618, Type F
- D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture" ASTM C 494, Type D.

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2.6 VAPOR BARRIER SYSTEM

- A. Vapor Barrier System: ASTM E 1745, Class A, polyolefin sheet, not less than 10 mil.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- G. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - 1. Evaporation Retarder:
 - a. Sure Film; Dayton Superior Corporation.
 - b. Eucobar; Euclid Chemical Co.
 - c. E-Con; L&M Construction Chemicals, Inc.
 - d. Confilm; Master Builders, Inc.
 - e. Waterhold; Metalcrete Industries.
 - f. Rich Film; Richmond Screw Anchor Co.
 - g. SikaFilm; Sika Corporation.
 - h. Finishing Aid; Symons Corporation.
 - 2. Clear, Solvent-Borne, Membrane-Forming Curing Compound:
 - a. Nitocure S; Fosroc.
 - b. Cure & Seal 309; Kaufman Products Inc.
 - c. L&M Dress & Seal 18; L&M Construction Chemicals, Inc.
 - d. CS-309; W. R. Meadows, Inc.
 - e. Seal N Kure; Metalcrete Industries.
 - f. Rich Seal 14 percent UV; Richmond Screw Anchor Co.

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- g. Kure-N-Seal; Sonneborn, Div. of ChemRex, Inc.
 - h. Clear Seal 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
3. Clear, Waterborne, Membrane-Forming Curing Compound:
- a. Safe Cure and Seal; Dayton Superior Corporation.
 - b. Aqua Cure VOX; Euclid Chemical Co.
 - c. Dress & Seal WB; L&M Construction Chemicals, Inc.
 - d. Vocomp-20; W. R. Meadows, Inc.
 - e. Metcure; Metalcrete Industries.
 - f. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
 - g. Cure & Seal 14 percent E; Symons Corporation.
 - h. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.

2.8 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

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2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
 2. Maximum Slump: 3 inches.
 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with site-verified 2- to 3-inch slump.
- D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
 2. Maximum Slump: 4 inches.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
- F. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete required to have low water permeability. This includes elevator pits and basement walls.
- G. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete exposed to deicers or subject to freezing and thawing while moist. This includes exterior slabs and walls.

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- H. Maximum Water-Cementitious Materials Ratio: 0.40 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.
- I. Maximum Water-Cementitious Materials Ratio: 0.40 for all interior slabs.
- J. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
 - 1. Air Content: 5.5 percent for 1-1/2-inch- nominal maximum aggregate size.
 - 2. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
 - 3. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.
- K. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- L. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- M. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Only when specifically approved by the Architect. Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

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1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for surfaces exposed to view.
 2. Class C, 1/2 inch all other surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Do not chamfer corners or edges of concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

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- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. At least 70 percent of 28-day design compressive strength.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

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- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR BARRIER SYSTEM

- A. Vapor Barrier System: Place, protect, and repair vapor-barrier sheets according to ASTM E 1643 and manufacturer's written instructions. Lap joints 6 inches minimum and seal with manufacturer's tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

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4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete as soon as possible when cutting action will not dislodge aggregate or otherwise damage surface usually 1 to 2 hours depending on mix design, environmental conditions, etc. and before concrete develops random contraction cracks, typically 1 to 2 hours depending on mix design, environmental conditions, etc.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

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- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation. Limit Free-Fall to a height of five (5) feet.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

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2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 2. Do not apply rubbed finish to smooth-formed finish.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

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1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
 - a. For thin-set flooring or resilient floor covering: Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17.
 - b. For carpet floors: Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

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- B. Curbs: Provide monolithic finish to interior curbs where indicated by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

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4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

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1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

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- a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
7. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests

SECTION 03300 - CAST-IN-PLACE CONCRETE

to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following when indicated:

1. Concrete masonry units.
2. Building (common) brick.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.

- B. Products furnished, but not installed, under this Section include the following:

1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

- B. Shop Drawings: Show fabrication and installation details for the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

- C. Samples for Initial Selection: For the following:

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1. Unit masonry Samples in full-scale form showing the full range of colors and textures.
 2. Colored mortar Samples showing the full range of colors.
- D. Samples for Verification: For the following:
1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
 3. Stone trim samples not less than 12 inches in length, showing the full range of colors and textures expected in the finished construction.
 4. Weep holes/vents in color to match mortar color.
 5. Accessories embedded in the masonry.
- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Mortar complying with property requirements of ASTM C 270
 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
- H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.

SECTION 04810 - UNIT MASONRY ASSEMBLIES

2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.

- I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Contractor shall employ and pay a qualified professional engineer to provide a survey and inspection of foundations for compliance with dimensional tolerances.
- C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Preconstruction Testing Service: The Contractor shall employ and pay for a qualified independent testing agency to perform the following preconstruction testing:
 1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
 2. Prism Test: For each type of wall construction indicated, per ASTM C 1314].
 3. Mortar Test: For mortar properties per ASTM C 270.
 4. Grout Test: For compressive strength per ASTM C 1019.
- F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- G. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.

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2. Build mockups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
 - a. Typical exterior wall with lower corner of window opening framed with stone trim at upper corner of mockup. Make opening approximately 12 inches wide by 16 inches high.
 3. Clean exposed faces of mockups with masonry cleaner as indicated.
 4. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 5. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 6. Protect accepted mockups from the elements with weather-resistant membrane.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
 9. Demolish and remove mockups when directed.
 10. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

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- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. This specification supersedes ACI 530.1/ASCE 6/TMS 602 in that masonry shall not be installed when the ambient temperature is 32 degF or below or the temperature of the masonry units is below 32degF, unless a heated temporary enclosure is provided for a minimum of 24 hours. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 when the ambient temperature is above 32degF. masonry products shall always be protected from the elements.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

SECTION 04810 - UNIT MASONRY ASSEMBLIES

- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

SECTION 04810 - UNIT MASONRY ASSEMBLIES

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
- C. CMU: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of $f'_m = 2500$ psi minimum and as noted in drawings.
 - 2. Density Classification: Medium weight unless otherwise indicated.
 - 3. Size (Width): Manufactured to dimensions $3/8$ inch less than nominal dimensions.
 - 4. Exposed Faces: provide color and texture matching the range represented by Architect's sample.
 - 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
- D. Concrete Building Brick: ASTM C 55.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi minimum and as noted in the drawings.
 - 2. Density Classification: Medium weight.
 - 3. Size (Actual Dimensions): $3-5/8$ inches wide by $3-5/8$ inches high by $7-5/8$ inches long.

2.5 CONCRETE AND MASONRY LINTELS

- A. General: Provide as shown in drawings.
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section "Cast-in-Place Concrete", and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforced bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

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2.6 BRICK

- A. General: Provide utility brick.
 - 1. Provide Face Brick Manufactured by: Bowerston Shale, or Glen-Gery, or Palmetto or approved equal.
- B. Provide shapes indicated and as follows for each form of brick required:
 - 1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- C. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- D. Building Brick: ASTM C 216, Grade SW, Type FBX and as follows:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 5,500 psi.
 - 2. Size: Manufactured to the following actual dimensions:
 - a. Utility: 3-5/8 inches wide by 3-5/8 inches high by 11 5/8 inches long (Type FBX).
 - 3. Application: Use where brick is indicated for concealed locations. Note that hollow brick is not simply face brick with the usual cores (holes); it is brick that has voids (cores and cells) exceeding 25 percent of the gross cross-sectional area. See Evaluations.
 - 4. Color and texture: Belden Brick 8632A Velour Special Mingle or Interstate Brick Mocha-Smokey Mountain Matte Blend or approved equal.

2.7 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

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- E. Mortar Cement: ASTM C 1329.
- F. Masonry Cement: ASTM C 91.
 - 1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.
 - a. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
 - b. Pigments shall not exceed 5 percent of mortar cement by weight for mineral oxides nor 1 percent for carbon black.
 - 2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
- G. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 1. White-Mortar Aggregates: Natural white sand or ground white stone.
 - 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.
- I. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- J. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- K. Cold-Weather Admixture: Permitted in accordance with ASTM C 494 Type E. No masonry work below 32 deg F.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- M. Water: Potable.
- N. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- O. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - 1. Colored Portland Cement-Lime Mix:
 - a. Eaglebond; Blue Circle Cement.

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- b. Color Mortar Blend; Glen-Gery Corporation.
 - c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
 - d. Centurion Colorbond PL; Lafarge Corporation.
 - e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
 - f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
2. Mortar Cement:
 - a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
 - b. Lafarge Mortar Cement; Lafarge Corporation.
 - c. Essroc Cement Corporation.
 3. Colored Mortar Cement:
 - a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
 - b. Spec Mix, Inc.
 - c. Montfort Bros.
 4. Colored Masonry Cement:
 - a. Magnolia Masonry Cement; Blue Circle Cement.
 - b. Brixment-in-Color; Essroc Materials, Inc.
 - c. Rainbow Mortamix Custom Color Masonry Cement; Holnam, Inc.
 - d. Centurion Colorbond; Lafarge Corporation.
 - e. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
 - f. Coosa Masonry Cement; National Cement Company, Inc.
 - g. Flamingo Color Masonry Cement; Riverton Corporation (The).
 - h. Richcolor Masonry Cement; Southdown, Inc.
 5. Mortar Pigments:
 - a. True Tone Mortar Colors; Davis Colors.
 - b. Centurion Pigments; Lafarge Corporation.
 - c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.
 6. Water-Repellent Admixture: See Section 07200

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 1. Interior Walls: Mill-galvanized carbon steel.

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2. Exterior Walls: **STAINLESS STEEL**.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, **STAINLESS STEEL** ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-winged loops connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
2. Basis of Design: Hohman & Barnard #270-2X S.I.S. ladder seismiclip interlock system joint reinforcement, standard weight, with hook spacing of 16 inches on center. Provide pre-fabricated tees and corners. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.
3. Provide H&B stainless steel adjustable wall ties, 3/16-inch diameter pintles and 3/16-inch diameter eyes with 2X-Hooks, Locate where additional ties are required at masonry openings and veneer movement joints.

E. BRICK MASONRY JOINT REINFORCEMENT

1. Stainless steel, truss type, with two side rods, one at each face of brick, with at least 5/8" cover on outside face.

2.9 TIES AND ANCHORS

- A. General: ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel with ASTM A 153/A 153M, Class B coating.
 6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
 7. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.
 8. Stainless-Steel Bars: ASTM A276 or ASTM A 666, Type 304.

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- C. Welded adjustable anchors for Connecting to Structural Steel Framing: Where indicated, or required, provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch diameter, hot-dip galvanized steel wire.
 3. Basis of design: Hohman & Barnard #359-C weld-on ties, with 8 inch offsets, 1/4 inch wire, Vee-Byna tie, wire diameter to match net tie space between structural steel and inside of weld-on ties plus or minus 1/16 inch clearance max, hot dip galvanized, shop welded to steel.
 4. Touch up welds with zinc-rich coating per approved shop paint SSPC-Paint 20 manufacturer's recommendations.
- D. Rigid anchors can be used to connect T-intersections of CMU shear walls in lieu of masonry bonding or bond beams. They are also often used at T-intersections of other CMU walls, although masonry bonding and T-shaped masonry-joint reinforcement may be used.
- E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- F. Adjustable Masonry-Veneer Anchors:
1. General: Provide Stainless Steel anchors that allow vertical adjustment but resist a minimum of 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.078-inch thick, stainless-steel sheet.
 3. Fabricate wire ties from 0.187 inch diameter, **STAINLESS STEEL** wire.
 4. Screw or and post installed anchor attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.
 - a. Attached to existing CMU
 - 1) Basis of Design: Hohmann & Barnard HB-5213 adjustable veneer anchor with 2X-Hook and insulation retaining washer or approved equal.
 - 2) Fasten to existing CMU with 3/8-inch diameter stainless-steel sleeve anchor (Basis of Design: Powers Fasteners, Powerbolt) hex head sleeve anchor with 1 1/4 inch embedment in CMU faceshell and located within cell of CMU per manufacturer's requirements.
 - 3) Acceptable products:
 - a) CTP-516 with CTP 2" post installed stainless steel and 2" bronze expansion anchor and insulation retaining washer.
 - b) Or approved equal

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- b. Attached to steel studs
 - 1) Basis of Design: Hohmann & Barnard H&B-213 adjustable stainless steel veneer anchor, 2X-Hook and insulation retaining washer. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.
 - 2) Fasten to steel stud with two (2) #10-16 hex head self-drilling screws with bonded neoprene washer and corrosion protective coating (Basis of Design: Hilti, Self-Drilling Screws and Kwik-Cote coating).
 - 3) Other acceptable products:
 - a) CTP-16 with fasteners noted above and insulation retaining washer.
 - b) Or approved equal.

- c. Attached to structural steel where indicated.
 - 1) Unless noted otherwise, Basis of Design: Hohmann & Barnard HB-213 stainless steel adjustable veneer anchor, 2X hooks and insulation retaining washer. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.
 - 2) Where indicated: Hohmann & Barnard 359-FH Stainless Steel with Vee Byna-Tie, 3 /16" wire tie diameter.
 - 3) Fasten to structural steel with two (2) 1/4 x 20 (Basis of Design: HILTI BI-METAL KWIK FLEX with HEX) washer head self-drilling fasteners.
 - 4) Other acceptable products:
 - a) CTP-16 with fasteners noted above and insulation retaining washer.
 - b) Or approved equal.

2.10 FLEXIBLE FLASHING TYPE 304 STAINLESS STEEL

A. LAMINATED STAINLESS STEEL FABRIC FLASHING, NON-ASPHALTIC.

B. Definitions:

- 1. Cavity wall flashing: Same as flexible flashing.
- 2. Foundation sill flashing: Same as flexible flashing.
- 3. Flexible flashing: Water-proof material typically used in cavity wall construction to contain and assist in the proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
- 4. Head and sill flashing: Same as flexible flashing.
- 5. Through-wall flashing:
 - a. Generally considered the same as flexible flashing.
 - b. Rare definition referred to full width cap flashing under copings or wall caps.

C. Submittals: Provide these documents in one complete shop drawings.

- 1. Product data: Indicate material type, composition, thickness, and installation procedures.
- 2. Samples: 3" by 5" flashing material.

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3. Product quality and environmental submittals
 - a. Certificates:
 - 1) Indicate materials supplied or installed are asbestos free.
 - 2) Indicate recycled content: 60% total recycled material; based on 60% Post Industrial Recycled Content.
 - b. Minimum Performance Requirements:
 - 1) Tensile strength, 100,000 psi minimum average
 - 2) Puncture Resistance, 2,500 pounds average
 - 3) When tested as manufactured, product resists growth of mold pursuant to test method ASTM D3273.
 - 4) Fire Rating: flame spread and smoke generation
 1. Rated Class A, ASTM E84
 - 5) Certify the use of domestic manufactured stainless steel for flashing.
 - 6) Certify products contain no silica or asbestos.
4. Required Compatibility letter:
 - a. Provide compatibility letter from the Air Barrier System and Flashing System manufacturer.

D. QUALITY ASSURANCE

1. Qualifications:
 - a. Manufacturer: Provide flashing materials by single manufacturer with not less than twenty-five years of experience in manufacturing flexible flashing products.
 - b. Flashing materials must be able to withstand 300° F temperature without changing the long-term performance of the flashing.

E. Required Compatibility Letter: Provide compatibility letter from the Air Barrier System and Flashing System manufacturer.

F. Warranty

1. Special warranty:
 - a. Manufacturer: Warrant flexible flashing material for life of the wall
 - b. Begin warranty at the Date of Substantial Completion.

G. MANUFACTURED UNITS

1. Product standard of quality:
 - a. York Manufacturing, Inc.; Multi-Flash SS- Basis of Design.
 - b. Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
 - c. Prosoco, Inc.; R-Guard SS ThruWall

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- d. STS Coatings, Inc.; Wall Guardian Stainless Steel TWF
 - e. TK Products, Inc.; TK TWF
 - f. Approved equal products that meet the criteria in section 1.04 to 1.06.
2. Characteristics:
- a. Type: **Stainless Steel** core with polymer fabric laminated to the bottom stainless steel face with non-asphalt adhesive. The top face (exposed side) must not be covered with a polymer fabric.
 - b. **Stainless Steel:** type 304, ASTM A240. Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009.
 - c. Fabric: polymer fabric; laminated back face (non-exposed side) of stainless steel core.
 - d. Size: Manufacturer's standard width rolls.

H. ACCESSORIES:

1. Mastic/sealant: The Basis of Design is York Manufacturing, Inc.; UniverSeal US100 or approved equal.
 - a. Characteristics:
 - 1) Type: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50.
2. End dam: Provide preformed pieces by the flashing manufacturer using:
 - a. Stainless steel: 26 gauge stainless steel
3. Splice material: Product standard of quality is York304 SS by York or approved equal. Manufacturer's standard self-adhered metal material; material matching system material or use Multi-Flash Stainless Steel 6" lap piece and polyether sealant as a splice.
4. Termination bar: Product standard of quality is York T-96 termination bar or approved equal. Manufacturer's standard 1" composite material bar or a 1" 26 gauge stainless steel termination bar with sealant lip.
5. Weep vent protection: Product standard of quality is York's Weep Armor or approved equal. Geotextile drainage fabric at least 12" in height.
6. Repair and other materials/accessories: Manufacturer's standard.
7. Fasteners: 304 Stainless Steel Domestic manufactured fastener types and sizes recommended by flashing manufacturer for intended use.

I. INSTALLATION

1. General

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- a. Install where indicated, specified, or required in accord with flashing manufacturer's written instructions and as follows.
- b. Extend flashing 8" minimum beyond opening. Provide pre-manufactured end dam units made of 26 gauge stainless steel.
- c. Flashing width: Width required starting flush with outside face of exterior wythe, extending through cavity, rising height required to extend above lintel steel at least 2". **Flashing shall be installed a minimum of 1" past the face of veneer and cut off flush after inspection by C. M. or Architect.**
- d. Splice end joints by overlapping them 6" and seal with a compatible sealant or metal splice tape.
- e. Masonry back up:
 - 1) Coordinate with fluid applied membrane air barrier installation, in accordance with manufacturer's installation instructions.
 - 2) Embed flashing between CMU masonry installation and seal the top edge with compatible sealant.
- f. Concrete back up:
 - 1) Surface apply after fluid applied membrane air barrier installation in accordance with manufacturer's installation instructions.
 - 2) Fasten to concrete surface at top by embedding in layer of sealant or use a non-corrosive termination bar and fasten it to the backer wall at the top edge of the flashing and seal the top edge with a compatible sealant.
- g. Stud back up with sheathing:
 - 1) Fasten to stud back-up. Install double faced butyl tape then install a non-corrosive termination bar and fasten it to the backer wall at the top edge of the flashing and seal the top edge with a compatible sealant.
- h. Leave ready for certified compatible air barrier installation lapping flashing top installed in another Section.
- i. Lay flashing in continuous bead of sealant on masonry supporting steel.
- j. Provide purchased manufacturers preformed end dams.
- k. Inside and outside corners: Provide purchase manufactured corners from manufacturer.
- l. Cover flashing within a few days of installation to protect it from damage from the different trades, the environment and falling debris. If flashing is left unprotected and it is punctured, torn, or has loose scrim you should contact the manufacturer for repair instructions.

J. SCHEDULES

1. Locations:
 - a. Exterior door heads.
 - b. Window heads and sills.
 - c. Storefront heads.
 - d. Horizontal control joints.

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- e. Changes in veneer materials, vertically.
- f. Other wall openings.
- g. Other locations indicated.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D 226M, Type 1 (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products:
 - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - 2. Products
 - a. Basis of Design: Hohmann & Barnard QV Quadro Vent full mortar joint height
Color to match mortar
 - b. Or approved equal.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
- F. Exterior Wall Expansion Joint Covers: Provide pre-manufactured silicone-coated, precompressed primary seal assembly at all exterior expansion joints.
- G. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - 1. Plastic Weep Hole/Vent:

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- a. Cell Vent; Dur-O-Wal, Inc.
 - b. Or Approved Equal
2. Cavity Drainage Material:
- a. Mortar Break; Advanced Building Products, Inc.
 - b. CavClear Masonry Mat; CavClear.
 - c. Mortar Net; Mortar Net USA, Ltd.
 - d. Mortar Stop; Polytite Manufacturing Corp.
 - e. Or Approved Equal
3. Reinforcing Bar Positioners:
- a. #RB Rebar Positioner; Hohmann & Barnard, Inc.
 - b. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
 - c. Or Approved Equal
4. Exterior Wall Expansion Joint Cover:
- a. Seismic Colorseal; EMSEAL LLC.
 - b. Or Approved Equal

2.12 CAVITY-WALL INSULATION

- A. Continuous Insulation Xci foil wall panels: Comply with NFPA 285 exterior wall assembly and ASTM C1289. Panels are a high thermal resistive rigid insulation panel composed of a closed cell Polyisocyanurate foam core bonded to an impermeable foil facer. Provide type: ASTM C1289, type 1 Grade (3) = 25 PSI thickness 1.5 inches (38 mm)/R-value 10.0. Provide panel fasteners that are corrosive resistant with length and embedment as recommended by panel manufacturer.
- B. Basis of Design Product: Hunter Panels Xci Foil. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.

2.13 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following or approved equal:

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- a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
 - 1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 600 Detergent; ProSoCo, Inc.
 - 3) Florok 700 Masonry Detergent; Chargar Corporation.

- b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
 - 1) 200 Lime Solv; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
 - 3) Chargar Corporation.

- c. Cleaners for Brick Subject to Metallic Staining:
 - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
 - 2) Sure Klean Vana Trol; ProSoCo, Inc.
 - 3) Chargar Corporation.

2.14 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.
 - 1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
 - 2. Limit cementitious materials in mortar for exterior and reinforced] masonry to portland cement, mortar cement, and lime.
 - 3. For masonry below grade, in contact with earth, and where indicated, use Type S.
 - 4. For reinforced masonry and where indicated, use Type S.
 - 5. For exterior ,veneer brick use Type N.

- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of Portland cement by weight

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2. Mix to match Architect's sample.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type fine that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Self-consolidated grout where indicated (SCG): ASTM C476 fine grout, pre-batched, pre-bagged, dry ingredients ready for hydration at the project site. Site proportioned grout will be rejected.
 - a. Specified minimum 28-day compressive strength is 3000 psi (ASTM C1019);
 - b. Slump flow (ASTM C1611) 24 inches to 28 inches;
 - c. T50 = 2 to 5 seconds
 - d. Visual Stability Index (VSI) = 0;
 - e. Basis of Design: SPEC MIX SCG, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

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- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements: or minus 1/4 inch (6 mm).
 - 1. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 2. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet or 1/2 inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet or 1/2 inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet in, 3/8 inch in 20 feet or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2 inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3mm), with a maximum thickness limited to 1/2 inch.

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2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joints and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
 2. Stack bond.
 3. One-third running bond.
 4. As indicated on Drawings.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

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1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMU as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with grout at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4. Rake out mortar joints for pointing with sealant.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

F. Cut joints flush where indicated to receive waterproofing, cavity wall insulation and air barriers unless otherwise indicated.

3.6 BONDING OF MULTI-WYTHE MASONRY

A. Use bonding system indicated on Drawings.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

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1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITY WALLS

- A. Bond wythes of cavity walls together as follows:
1. Individual Metal Ties as indicated on drawings: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties around openings and space as indicated around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
 3. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity. Provide clean out units (CMU or clay facing) every other unit for the length of the work. Remove accumulated mortar at completion of each lift of work. Install cleanout unit after top of masonry is completed.
- D. Parge all cavity face of backup wythe in a single coat to match existing (approximately 1/2 inch (10 mm)) thick. Trowel face of parge coat smooth to match existing and as required by the air barrier manufacturer.

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3.8 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and structural steel and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten fastener-attached anchors through sheathing to wall framing and to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than one anchor for each 1.77 sq. ft. of wall area. Install additional anchors around openings and at intervals, not exceeding 8 inches, around perimeter and as indicated.
- B. Provide not less than 1 inch of airspace between back of masonry veneer and face of insulation.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace. Provide clean out units (CMU or clay facing) every other unit for the length of the work. Remove accumulated mortar at completion of each lift of work. Install cleanout unit after top of masonry is completed.

3.9 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement at minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Install brick masonry joint reinforcement at heads and sills of openings in brick veneer as indicated. Coordinate bed joint locations with adjustable anchor/ties. Do not install joint reinforcement in the same bed joint as the anchor/ties.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL

- A. Anchor masonry to structural steel, where masonry abuts or faces structural steel or concrete, to comply with the following:

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1. Provide an open space not less than 1 inch wide between masonry and structural steel unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade at junctures with horizontal expansion joints if any.
 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 3. Build in compressible joint fillers where indicated.
 4. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of sealant and backer rod.
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod but not less than 1/2 inch.
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

- A. Install galvanized steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches for block-size units shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

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3.13 FLASHING, WEEP HOLES, WATERPROOFING AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, and tape as recommended by flashing manufacturer.
 - 2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing or masonry backup in accordance with barrier system manufacturer requirements at least 8 inches; with upper edge tied into water-resistive barrier, lapping at least 6 inches. Fasten upper edge of flexible flashing to sheathing through termination bar. Provide cut off sealant above termination bar to CMU.
 - 3. At lintels and shelf angles, extend flashing at minimum of 6 inches into masonry at each end. At heads and sills, extend flashing a minimum of 6 inches at ends and turn up not less than 2 inches to form end dams at nearest head joint.
 - 4. Install metal drip plates beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to tope of metal drip plate.
 - 5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to tope of metal flashing termination.
 - 6. Provide minimum of 3 inches lap into drip plate. Set drip plate in continuous bed of butyl sealant. Set butyl on grouted solid brick course.
 - 7. Install continuous self-adhering base of wall waterproofing flush to exterior surface of trench foundation wall, extend horizontally inward to intersecting masonry wall and rise to the underside of through wall flashing location, terminate with termination bar to CMU wall, prime surfaces as required by approved manufacturer to provide complete adhesion.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.

3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace,

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tie and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform test and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.16 REPAIRING, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes and completely fill with mortar. Point up joints, including corners, openings and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

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3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to the manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook".

3.17 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excel masonry materials are Contractor's property. At completion of unit masonry work, remove from project site.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used, as described above or recycled, and other masonry waste and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes structural steel.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.
- B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

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1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shop primers.
5. Nonshrink grout.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
- C. Comply with applicable provisions of the following specifications and documents:
 1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 3. AISC's "Seismic Provisions for Structural Steel Buildings."
 4. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
 5. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."
 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

SECTION 05120 - STRUCTURAL STEEL

- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS AS INDICATED.

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Carbon Steel: ASTM A 36.
 - 2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 992, Grade 50.
 - 3. High-Strength, Low-Alloy Structural Steel: ASTM A 588, Grade 50, corrosion resistant.
- B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
- C. Hot-Formed Structural Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - 1. Weight Class: Standard unless indicated otherwise.
 - 2. Finish: Black, except where indicated to be galvanized.
- E. Carbon-Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.
- F. High-Strength Steel Castings: ASTM A 148, Grade 80-50.
- G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- H. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 - 1. Unheaded Rods: ASTM A 36.
 - 2. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.

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3. Headed Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts. Use where high strength bolts are indicated.
4. Washers: ASTM A 36.
- I. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
 1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.
- J. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.
- K. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 1. Finish: Mechanically deposited zinc coating.
- L. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 1. Camber structural steel members where indicated.
 2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.
 3. Mark and match-mark materials for field assembly.
 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.

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5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust, scale, seam marks, roller marks, rolled trade names and roughness.
1. Remove blemishes by filling or grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded.
- D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.
- F. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.5 SHOP CONNECTIONS

- A. Shop install and tighten high-strength bolts according to RCSC's Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
- B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

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2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed-on fireproofing.
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
 - 1. SPC-SP 3 "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 1.5 mils.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.8 SOURCE QUALITY CONTROL

- A. The Contractor will employ and pay for an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

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- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

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- a. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- F. Do not use thermal cutting during erection.
- G. Finish sections thermally cut during erection equal to a sheared appearance.
- H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
 - 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface

SECTION 05120 - STRUCTURAL STEEL

bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Owner will employ and pay for an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing will be performed to determine compliance of corrected Work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Open-web K-series steel joists where indicated
 - 2. Joist accessories.

1.3 DEFINITIONS

- A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Design Loads: As indicated on the Structural Drawings
- B. Design joists to withstand design loads with total load deflections no greater than the following:
 - 1. Roof Joists: Vertical live load deflection of $1/360$ of the span.

1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.

SECTION 05210 - STEEL JOISTS

2. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation when required.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

SECTION 05210 - STEEL JOISTS

1.8 SEQUENCING

- A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for chord and web members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- D. Welding Electrodes: Comply with AWS standards.
- E. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

2.2 PRIMERS

- A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements in FS TT-P-664.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.
 - 1. Joist Type: K and KCS-series steel joists.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

SECTION 05210 - STEEL JOISTS

- F. Camber joists according to SJI's "Specifications", as required.
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 JOIST ACCESSORIES

- A. Retain one of three paragraphs below. Bridging refers to permanent bridging.
- B. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
- C. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications."
- D. Bridging: Fabricate as indicated and according to SJI's "Specifications."
 - 1. Furnish additional erection bridging if required.
- E. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.
- F. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."
- G. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- H. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.6 CLEANING AND SHOP PAINTING

- A. Retain this Article if shop cleaning and priming are required.
- B. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- C. Do not prime paint joists and accessories to receive sprayed fire-resistive materials].
- D. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
- E. Painting of joists and joist accessories is specified in Division 9 Section "Painting."

SECTION 05210 - STEEL JOISTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.
- E. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall employ and pay for a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Field welds will be visually inspected according to AWS D1.1.

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- C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:
 - 1. Magnetic Particle Inspection: ASTM E 709.
 - 2. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
 - 1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
 - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 - 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Section "Painting."
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, Installer and Engineer that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck when indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
 - 1. Mechanical fasteners.
- F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

SECTION 05310 - STEEL DECK

- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- F. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.6 COORDINATION

- A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 7 to ensure protection of insulation strips against damage from effects of weather and other causes.
- B. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Division 16 Section "Underfloor Raceway" with installation of cellular metal floor deck.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - 1. Steel Deck:
 - a. BHP Steel Building Products USA Inc.

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- b. Consolidated Systems, Inc.
- c. Epic Metals Corp.
- d. Marlyn Steel Products, Inc.
- e. Nucor Corp.; Vulcraft Div.
- f. Roof Deck, Inc.
- g. United Steel Deck, Inc.
- h. Verco Manufacturing Co.
- i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Deck Profile: As Indicated.
 - 3. Profile Depth: As indicated
 - 4. Design Uncoated-Steel Thickness: As indicated
 - 5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated
 - 6. Span Condition: As indicated.
 - 7. Side Laps: As indicated

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.

SECTION 05310 - STEEL DECK

- H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- J. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, .0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.
- L. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- M. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.
- N. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- O. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.

SECTION 05310 - STEEL DECK

- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated, and as follows
 - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

SECTION 05310 - STEEL DECK

- G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 7 .

3.4 FIELD QUALITY CONTROL

- A. Testing: Owner shall employ and pay for a qualified independent testing agency to perform field quality-control testing.
- B. Field welds will be subject to inspection.
- C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
 - 1. Shear connector stud welds will be visually inspected.
 - 2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
 - 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work that does not comply with specified requirements.
- F. Additional testing and inspecting will be performed to determine compliance of corrected work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior non-load-bearing wall framing.

1.3 DEFINITIONS

- A. Minimum Base Steel Thickness: Minimum base thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold- formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Interior Non-Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height for backing brick veneer and 1/360 of the wall height for backing others.
 - c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
 - 2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg. F.
 - 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions." and AISI S240.

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1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Provide Shop Drawings prepared by cold-formed metal framing manufacturer. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 1. For cold-formed metal framing indicated to comply with design loads, include structural Analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill certificates by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
 1. Expansion anchors.
 2. Steel Sheet.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Miscellaneous structural clips and accessories.
- G. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

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1. Products to be certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.
- B. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.
- D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- E. Product Tests: Mill certificates by steel sheet producer or test reports from a qualified independent testing agency [, or in-house testing with calibrated test equipment,] indicating steel sheet complies with requirements, including base steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.
- F. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- G. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.
- H. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- I. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- J. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- K. Comply with AISI's S100 "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing, and AISI S240.
- L. Comply with HUD's "Prescriptive Method for Residential Cold-Formed Steel Framing."
- M. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following or approved equal:
 - 1. The Steel Network, Inc.
 - 2. ClarkDietrich.
 - 3. AllSteel Products, Inc.
 - 4. MarinoWare; Div. of Ware Industries, Inc.
 - 5. United Metal Products, Inc.
 - 6. Steel Construction Systems.
 - 7. Or Approved equal.

2.2 MATERIALS

- A. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.
- B. Steel Sheet: ASTM A1003/A1003M; A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 33 minimum or as required by structural performance.
 - 2. Coating: [CP 60: G60 (Z180), A60 (ZF180), AZ50 (AZM150), or GF30 (ZGF90)] [CP 90: G90 (Z275), AZ50 (AZM150), or GF45 (ZGF135)]
- C. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with AISI S240 and as follows:
 - 1. Minimum Uncoated-Steel Thickness: Matching steel studs.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:

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1. Minimum Base-Steel Thickness: Matching steel studs.
 2. Flange Width: Manufacturer's standard deep flange width
- E. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.3 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base Steel Thickness: 0.0428 inch
 2. Flange Width: 1-5/8 inches
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base Steel Thickness 0.0428 inch
 2. Flange Width: 1-1/4 inches
- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. ClarkDietrich.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
 - e. Or approved equal
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. ClarkDietrich.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
 - e. Or approved equal
 2. Minimum Base Steel Thickness: 0.0428
 3. Flange Width: 1 inch plus the design gap for 1-story structures

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- E. Slotted Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure, as follows:
1. ClarkDietrich; MaxTrak Slotted Deflection Track or approved equal.
 2. Leg Dimension: 2-1/2 inches with 1-1/2-inch slot
 3. Minimum Thickness: 0.0428 inch
- F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base Steel Thickness: 0.0428 inch
 - b. Flange Width: 1 inch plus the design gap for 1-story structures
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base Steel Thickness: 0.0428 inch
 - b. Flange Width: Equal to sum of outer deflection track flange width plus 1 inch
- G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
1. ClarkDietrich; Drift FastClip Slide Clip (D-FCSC) or approved equal.
 2. Minimum Base-Steel Thickness: 0.0677 inch

2.4 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Steel Thickness: 0.0329 inch.
 2. Flange Width: 1-5/8 inches.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.

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- a. ClarkDietrich; Spazzer 5400 Bridging Bar (SPZS) or approved equal.
3. Web stiffeners.
 - a. ClarkDietrich; Quick Twist Web Stiffener (QTWS) or approved equal.
4. Anchor clips.
 - a. ClarkDietrich; Moment Clip (MC Series) or approved equal.
5. End clips.
6. Foundation clips.
 - a. ClarkDietrich; Pony Wall PW48 or approved equal.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
 - a. ClarkDietrich; Universal Joist Hanger (UJH) or approved equal.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035B,

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- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
 - 1. Product: ClarkDietrich; Panel Lift Clip (PLC) or comparable product.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. A Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, AISI S240, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

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- a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
- 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
- 1. Anchor Spacing: 24 inches (610 mm).
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch (3 mm) between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
- 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

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- E. Align floor and roof framing over studs in accordance with AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
 - F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
 - G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads. A single proprietary jamb member designed specifically for the purpose of supporting the header may be used in lieu of multiple members.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
 - H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
 - I. Install horizontal bridging in stud system, spaced vertically 48 inches.
 - 1. Channel Bridging: Cold-formed steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed in accordance with manufacturer's written instructions.
 - J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
 - K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
- 3.5 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL INSTALLATION
- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

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- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches (Unless noted otherwise)
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
 - 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at 96-inch centers or as indicated on Shop Drawings.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.6 GYPSUM SHEATHING INSTALLATION

- A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.
- B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

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- C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
- D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
- E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- F. Horizontal Installation: Install 24-inch- wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- G. Vertical Installation: Install 48-inch wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- H. Air-Infiltration Barrier Application: Cover sheathing with air-infiltration barrier as follows:
 - 1. Cut back air-infiltration barrier 1/2 inch on each side of break in supporting members at expansion- or control-joint locations.
 - 2. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6-inch end lap; fasten to sheathing with corrosion-resistant staples.
 - 3. Apply proprietary building wrap to comply with manufacturer's written installation instructions.
 - 4. Apply air-infiltration barrier to cover vertical flashing with 4-inch overlap.
- I. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:
 - 1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will employ and pay for a qualified independent testing agency to perform field quality-control testing.
- B. Field and shop welds will be subject to inspection and testing.

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- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing and inspecting will be performed to determine compliance of corrected Work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.

3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.
- D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Loose steel lintels.
 - 2. Steel framing and supports for mechanical equipment.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
 - 3. Hardware
- B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

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- C. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL

- A. Concrete Materials and Properties: Normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.

SECTION 05500 - METAL FABRICATIONS

- C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
 - H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 - I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - J. Remove sharp or rough areas on exposed traffic surfaces.
 - K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- 2.8 LOOSE STEEL LINTELS
- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - B. Weld adjoining members together to form a single unit where indicated.
 - C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

SECTION 05500 - METAL FABRICATIONS

- D. Galvanize loose steel lintels located in exterior walls.

2.9 SHELF ANGLES AND WELDED STEEL BOX CHASES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
- C. Galvanize shelf angles to be installed in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- D. Galvanize miscellaneous framing and supports where indicated.

2.11 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

SECTION 05500 - METAL FABRICATIONS

- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
 - 1. Support steel beams on solid grouted masonry, concrete, or on existing structural steel.

SECTION 05500 - METAL FABRICATIONS

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following as indicated on the drawings:
 - 1. Galvanized steel pipe and tube handrails and railings. (For all exterior work.)
 - 2. Stainless-steel pipe and tube handrails and railings.
 - 3. Steel pipe and tube handrails and railings.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
 - 1. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
 - 2. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."
 - 3. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.
- C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:
 - 1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbs applied at any point and in any direction.
 - b. Uniform load of 50 lbs/ft. applied horizontally and concurrently with uniform load of 100 lbs/ft. applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbs applied at any point and in any direction.

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- b. Uniform load of 50 lbs/ft. applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
- 3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbs applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
 - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- D. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected handrails and railings.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
 - 1. Provide structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation for all handrails and railings compliant with the current Code (IBC 2018 NJ Edition).
- C. Samples for Initial Selection: Short sections of railing or flat, sheet metal samples showing available mechanical finishes.
- D. Provide samples as requested by the Owner for each type of railing, handrails and handrail brackets to the post.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

SECTION 05521 - PIPE AND TUBE RAILINGS

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in New Jersey and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.6 STORAGE

- A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

- A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - 1. Steel and Stainless-Steel Pipe and Tube Railings:
 - a. High Point Architectural Metal.
 - b. Architectural Art Mfg., Inc.
 - c. Blum: Julius Blum & Co., Inc.
 - d. Approved equal.

2.2 METALS

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Stainless Steel: Grade or type designated below for each form required: Provide all pipes, tubing, castings and plate stainless steel from type 304 stainless for interior railings and type 316 for exterior railings.
- C. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
 - 1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 - a. Black finish, unless otherwise indicated.
 - b. Galvanized finish for exterior installations and where indicated.
 - c. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 4. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510.
 - 5. Iron Castings: Gray iron complying with ASTM A 48, Class 30.
- D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails

SECTION 05521 - PIPE AND TUBE RAILINGS

and railings to other types of construction indicated and capable of withstanding design loads.

1. For stainless-steel handrails and railings, use fasteners fabricated from Type 304 stainless steel for interior work and Type 316 stainless steel for exterior work.
 2. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Cast-in-Place and Post installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Cast-in-place anchors.
 2. Chemical anchors.
 3. Expansion anchors.

2.4 PAINT

- A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

2.5 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Interior Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create

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pourable anchoring, patching, and grouting compound. Use for interior applications only.

- C. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:
 - 1. As detailed.
 - 2. By bending.
 - 3. By radius bends of radius indicated.
 - 4. By flush radius bends.
 - 5. By mitering at elbow bends.
 - 6. By inserting prefabricated flush-elbow fittings.
 - 7. By any method indicated above as detailed in the drawings, applicable to change in direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

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- F. Nonwelded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.
- G. Welded Connections for Aluminum Pipe: Fabricate pipe handrails and railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
- I. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- J. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.
- K. For removable railing posts, fabricate slip-fit sockets from steel tube whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- L. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- M. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- N. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- O. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
- P. Fabricate joints that will be exposed to weather in a watertight manner.
- Q. Close exposed ends of handrail and railing members with prefabricated end fittings.
- R. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.

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- S. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
- T. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails and railings.

2.8 STAINLESS-STEEL FINISHES

- A. Remove or blend tool and die marks and stretch lines into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 180-Grit Polished Finish: Oil-ground, uniform, textured finish.
- D. 320-Grit Polished Finish: Oil-ground, uniform, smooth finish.
- E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
- F. Bright, Directional Polish: No. 4 finish.
- G. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.9 STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.

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2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. For nongalvanized steel handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings:
 1. Exteriors (SSPC Zone 1B): SSPC-SP 6, "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."
- F. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Do not apply primer to galvanized surfaces.
 2. Stripe paint edges, corners, crevices, bolts, and welds.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
 1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

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- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
 - 1. Nonshrink, nonmetallic grout.
 - 2. Nonshrink, nonmetallic grout or anchoring cement.
- C. Cover anchorage joint with flange of same metal as post, attached to post as follows:
 - 1. Welded to post after placing anchoring material.
 - 2. By set screws.
- D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch build-up, sloped away from post.

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- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless-steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
 - 2. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post installed anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
 - 1. Weld flanges to railing ends.
 - 2. Connect flanges to railing ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with manufactured machined wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

SECTION 05521 - PIPE AND TUBE RAILINGS

- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Wood furring, grounds, nailers, and blocking.
 - 4. Sheathing.
 - 5. Subflooring.

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.
- B. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for the following products:
 - 1. Engineered wood products.
 - 2. Underlayment.
 - 3. Insulating sheathing.
 - 4. Air-infiltration barriers.
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

SECTION 06100 - ROUGH CARPENTRY

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- B. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 1. Wood-Preservative-Treated Materials:
 - a. Baxter: J. H. Baxter Co.
 - b. Chemical Specialties, Inc.
 - c. Continental Wood Preservers, Inc.
 - d. Osmose Wood Preserving, Inc.
 - e. or approved equal
 2. Laminated-Veneer Lumber:
 - a. Alpine Structures.
 - b. Georgia-Pacific Corp.
 - c. Trus Joist MacMillan.
 - d. or approved equal
 3. Prefabricated Wood I-Joists:
 - a. Trus Joist MacMillan.
 - b. Alpine Structures.
 - c. Georgia-Pacific Corp.

SECTION 06100 - ROUGH CARPENTRY

- d. or approved equal
- 4. Gypsum Sheathing Board:
 - a. Georgia-Pacific Corp.
 - b. National Gypsum Co.; Gold Bond Building Products Division.
 - c. United States Gypsum Co.
 - d. or approved equal
- 5. Air-Infiltration Barriers:
 - a. Celotex Corporation (The); Building Products Division.
 - b. DuPont Company; Fibers Department.
 - c. or approved equal

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority (Canadian).
 - 3. RIS - Redwood Inspection Service.
 - 4. SPIB - Southern Pine Inspection Bureau.
 - 5. WCLIB - West Coast Lumber Inspection Bureau.
 - 6. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
- B. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m).

SECTION 06100 - ROUGH CARPENTRY

- C. All preservative treated materials should all be secured by stainless steel screws or fasteners with isolated material to all metal members.

2.4 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
- B. Non-Load-Bearing Interior Partitions: Provide framing of the following grade and species:
 - 1. Grade: No. 2.
 - 2. Species: Eastern softwoods; NELMA.
 - 3. Species: Northern species; NLGA.
 - 4. Species: Mixed southern pine; SPIB.
 - 5. Species: Western woods; WCLIB or WWPA.
 - 6. Species: Any species above.
- C. Exterior and Load-Bearing Walls: Provide framing of the following grade and species:
- D. Framing Other than Non-Load-Bearing Partitions: Provide framing of the following grade and species:
 - 1. Grade: No. 2.
 - 2. Species: Spruce-pine-fir south; NELMA.
 - 3. Species: Hem-fir north; NLGA.
 - 4. Species: Spruce-pine-fir north; NLGA.
 - 5. Species: Mixed southern pine; SPIB.
 - 6. Species: Hem-fir; WCLIB or WWPA.
 - 7. Species: Any species above.

2.5 BOARDS

- A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:
 - 1. Moisture Content: 19 percent maximum.
 - 2. Species and Grade: Spruce-pine-fir, C & Btr per WCLIB rules or C Select per NLGA or WWPA rules.
 - 3. As noted on plans by Architect.
- B. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:
 - 1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.
 - 2. Species and Grade: Mixed southern pine, No. 2 per SPIB rules.
 - 3. Species and Grade: Spruce-pine-fir, Standard per WCLIB rules or No. 3 Common per WWPA rules.
 - 4. Species and Grade: Western woods, Standard per WCLIB rules or No. 3 Common per WWPA rules.
 - 5. Species and Grade: Any species above.

SECTION 06100 - ROUGH CARPENTRY

2.6 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.7 ENGINEERED WOOD PRODUCTS

- A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements:
 - 1. Extreme Fiber Stress in Bending: 2500 psi (17 MPa) for 12-inch nominal- (286-mm actual-) depth members.
 - 2. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).
 - 3. Tension Parallel to Grain: 1850 psi (13 MPa).
 - 4. Compression Parallel to Grain: 2800 psi (19 MPa).
 - 5. Compression Perpendicular to Grain: 400 psi (3 MPa) perpendicular to and 500 psi (3.5 MPa) and parallel to glue line.
 - 6. Horizontal Shear: 285 psi (2 MPa) perpendicular to and 190 psi (1.3 MPa) parallel to glue line.
- C. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements:
 - 1. Flange Material: Laminated-veneer lumber.

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2. Web Material: Oriented-strand board (OSB) complying with DOC PS 2.
3. Web Material: Plywood complying with DOC PS 2.
4. Web Material: Either material indicated above, as standard with joist manufacturer.
5. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
6. Sizes: Depths and widths as indicated, with flanges not less than 1-1/2 inches (38 mm) in actual width.
7. I-Joists shall be installed with all required anchors, stiffeners and bracing in accordance with manufacturer requirements.

2.8 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
 1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30V, "APA Design/Construction Guide: Residential & Commercial."
- B. Subflooring: APA-rated sheathing.
 1. Exposure Durability Classification: Exposure 1.
 2. Span Rating: 48/24.
 3. Minimum thickness: 5/8 inch.
 4. Floor sheathing shall be tongue and groove and installed with both construction adhesive and required nailing.
- C. Wall Sheathing: APA-rated sheathing.
 1. Exposure Durability Classification: Exposure 1.
 2. Span Rating: As required to suit stud spacing indicated.
 3. Minimum thickness indicated on plan.
- D. Roof Sheathing: APA-rated sheathing.
 1. Exposure Durability Classification: Exterior, Structural I, Exposure 1.
 2. Minimum Span Rating: 32/16.
 3. Minimum thickness: 3/4 inch.
 4. Roof sheathing shall be installed with panel clips.

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2.9 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.10 AIR-INFILTRATION BARRIER

- A. Air retarder complying with ASTM E 1677; made from polyolefins; either cross-laminated films, woven strands, or spunbonded fibers; coated or uncoated; with or without perforations to transmit water vapor but not liquid water; and as follows:
 - 1. Minimum Thickness: 3 mils (0.08 mm).
 - 2. Minimum Water-Vapor Transmission: 10 perms (575 ng/Pa x s x sq. m) when tested according to ASTM E 96, Procedure A.
 - 3. Maximum Flame Spread: 25 per ASTM E 84.
 - 4. Minimum Allowable Exposure Time: 3 months.

2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. All fasteners to secure pressure treated lumber/plywood shall be Type 304 Stainless Steel.

2.12 METAL FRAMING ANCHORS

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

SECTION 06100 - ROUGH CARPENTRY

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.
- C. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
1. Thickness: 0.064 inch (1.6 mm).
- D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
1. Strap Width: 2 inches (50 mm).
 2. Thickness: 0.064 inch (1.6 mm).
- E. Bridging: Rigid, V-section, nailless type, 0.064 inch (1.6 mm) thick, length to suit joist size and spacing.
- F. Rafter Tie-Downs (Hurricane Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-5/8 inches (41 mm) wide by 0.052 inch (1.3 mm) thick minimum. Tie-Downs must be selected to meet uplift forces as calculated in the wood truss design.

2.13 THERMO-PLY SHEATHING

- A. Standard Grade – Green, 0.78” for use in attic to secure under truss rafter for supporting glass fiber insulation board.
- B. Pre-cut to 24” wide strip for easy field installation.
- C. Perm Rating: Minimum 0.63.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

SECTION 06100 - ROUGH CARPENTRY

- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWPAs M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Comply with applicable recommendations contained in APA Form No. E30V, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions in above-referenced guide.
 - 2. Roof sheathing shall be installed with 1/8" spacing at all edge and end joints for expansion per APA recommendations in above-referenced guide.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction."
 - 4. "Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- H. Use double hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- I. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD FRAMING, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Install framing members of size and at spacing indicated.
- D. Do not splice structural members between supports.
- E. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used,

SECTION 06100 - ROUGH CARPENTRY

provide closely fitted wood blocks of 2-inch nominal- (38-mm actual-) thickness lumber of same width as framing members.

3.3 THERMO-PLY SHEATHING:

- A. Provide conceal envelope in attic to support board insulation and to act as a vapor barrier.
- B. Pre-cut 24" wide strip to secure under wood truss rafter. Cut edge to clear truss web member.
- C. Tape joint between rafter without wood backing.

3.4 AIR-INFILTRATION BARRIER

- A. Cover sheathing with air-infiltration barrier as follows:
 - 1. Apply air retarder to comply with manufacturer's written instructions.
 - 2. Apply air-infiltration barrier to cover upstanding flashing with 4-inch (100-mm) overlap.

END OF SECTION 06100

SECTION 06651 - SOLID SURFACE WINDOWSILLS AND COUNTERTOPS

1.1 SUMMARY

- A. Section Includes solid surfacing fabrication including but not limited to the following:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.
 - 5. Solid surface material sinks.
 - 6. Solid Surface windowsill and Apron.

1.2 SUBMITTALS

- A. Product Data: For countertop materials and sinks.
- B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with Section 01300. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in the solid surface.
- C. Samples: For each type of material exposed to view.

1.01 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installers: Provide work of this Section executed by competent installers with minimum 5 years' experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.
- B. Mock-Ups:
 - 1. Prior to final approval of Shop Drawings, erect 1 full size mock-up of each component at Project site demonstrating quality of materials and execution for Architect review.
 - 2. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from Project site.
 - 3. Approved mock-up will be used as standard for acceptance of subsequent work.
 - 4. Approved mock-ups may remain as part of finished work.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

SECTION 06651 - SOLID SURFACE WINDOWSILLS AND COUNTERTOPS

B. Storage and Handling Requirements:

1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.

1.03 WARRANTY

- A. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer List: Products of the following manufacturers are acceptable subject to conformance to requirements of the Drawings, Schedules and Specifications:
1. Corian;
 2. Meganite;
 3. Wilsonart Contract;
 4. Or approved equal

2.2 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
1. Type: Provide Standard type unless Special Purpose type is indicated.
 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.3 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
- B. Configuration:
1. Front: Eased square edge with separate apron
 2. End Splash: Matching backsplash.
- C. Countertops: 1-inch-thick, solid surface material with radius edge built up with same material].
- D. Joints: Fabricate countertops without joints.

SECTION 06651 - SOLID SURFACE WINDOWSILLS AND COUNTERTOPS

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
 - 3. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0".
 - 4. Notify Architect in writing of any conditions which would be detrimental to installation.
- B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 INSTALLATION

- A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.
- B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.
- C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer's written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- D. Install countertops/sills with no more than 1/8" sag, bow or other variation from a straight line.
- E. Seal between wall and components with joint sealant as specified herein and in Section 07920, as applicable.
- F. Provide endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide sidesplashes at walls and adjacent millwork. Fabricate radius

SECTION 06651 - SOLID SURFACE WINDOWSILLS AND COUNTERTOPS

cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer's standard color-coordinated joint adhesive.

- G. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

3.3 REPAIR

- A. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer's instructions.

3.4 SITE QUALITY CONTROL

- A. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, re-stored or cleaned, to satisfaction of Architect at no cost to Owner.

3.5 CLEANING

- A. Remove excess adhesive and sealant from visible surfaces.
- B. Clean surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION

- A. Provide protective coverings to prevent physical damage or staining following installation for duration of construction phase.
- B. Protect surfaces from damage until date of Substantial Completion of the Work.

END SECTION 06651

SECTION 07132 – PRE-APPLIED SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.01. SUMMARY

A. This Section includes requirements for providing labor, materials, tools, and equipment to complete the Work as shown on the Drawings Architectural Division and as specified herein including, but not limited to, the following:

1. Pre-applied sheet membrane waterproofing that forms an integral bond to poured concrete for the following applications:
 - a. Vertical applications: Membrane applied against soil retention system prior to concrete foundation wall placement (Henry Blueskin Pre-seal 320) or membrane applied to poured concrete foundation walls (Henry WP-200 or approved equal).
 - b. Horizontal applications: Membrane applied on prepared subbase prior to concrete slab placement (Henry Blueskin Pre-Seal 435 or approved equal).

B. Pre-applied sheet membrane waterproofing must meet the following standards:

1. A single source manufacturer must warrant pre-applied sheet waterproofing components.
2. Pre-applied fully bonded polypropylene sheet waterproofing comprised of polypropylene film with a heat bonded dimple surfaced geotextile, used to form a mechanical and chemical bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete; having the following typical properties:
 - a. Resistance to Hydrostatic Head (ASTM D5385): 231 ft. (70.4m)
 - b. Puncture Resistance (ASTM E154)
 - c. Lateral Migration Resistance (ASTM D5385 Modified): 231 ft. (70.4m)
 - d. Lap Peel Adhesion (ASTM D1876): 6.9lbs/in (1200 N/m)
 - e. Permeance (ASTM E96): <0.1 Perms
 - f. Peel Adhesion to Concrete (ASTM D903): 5 lbs/in (875 N/m)

1.02. ADMINISTRATIVE REQUIREMENTS

A. Pre-installation meetings: A pre-applied pre-construction meeting must be completed to provide requirements and coordination for the waterproofing and subsequent warranty prior to the pre-applied waterproofing installation to maintain warranty eligibility. The pre-applied waterproofing pre-construction meeting is mandatory and must be attended by the Waterproofing Manufacturer Representative, General Contractor, Installing Contractor, Waterproofing Manufacturer's Qualified Inspector, Concrete/Shotcrete Contractor, Construction Manager, Owner's Representative and trades with associated scopes of work that directly affect the pre-applied waterproofing application or long-term ability to maintain a watertight assembly.

SECTION 07132 – PRE-APPLIED SHEET MEMBRANE WATERPROOFING

- B. Pre-applied waterproofing installations require independent inspection by a Waterproofing Manufacturer's Qualified Inspector at the expense and coordination of the Contractor. Independent inspections include, but are not limited to, the following:
 - 1. Monitor waterproofing installation and compliance with project specific requirements, Waterproofing Manufacturer's published literature and site specific details.
- C. The Contractor shall hire a Waterproofing Manufacturer's Qualified Inspector Independent Inspections:
 - 1. Waterproofing Manufacturer's Qualified Inspector to produce reports and digital photographs documenting each inspection. Failure to provide Waterproofing Manufacturer's Qualified Inspector independent inspections will result in delay or rejection of warranty request.
 - a. Waterproofing membrane installation start
 - b. Periodic intervals to verify continued compliance with project specific requirements, Waterproofing Manufacturer's published literature and site specific details
 - c. Waterproofing seam integrity.
 - d. Final inspection prior to concrete or backfill placement against the waterproofing, including at grade terminations and transition details

1.03. SUBMITTALS

- A. Provide the following requested information in accordance with Section 01300 – Submittals.
- B. Action Submittals:
 - 1. Product Data:
 - a. Waterproofing Manufacturer's guide specification
 - b. Waterproofing Manufacturer's technical data sheets
 - c. Waterproofing Manufacturer's standard details
 - d. Evidence that the waterproofing assembly meets specified requirements
 - e.
 - 2. Certificates:
 - a. Product certification stating that assembly components are supplied and warranted by a single source Waterproofing Manufacturer.
 - b. Statement that Installing Contractor is authorized by Waterproofing Manufacturer to complete Work as specified
 - c. Qualifications of the Contractor hired independent qualified inspector.

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1.04. QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain waterproofing and auxiliary materials from a single Waterproofing Manufacturer regularly engaged in the manufacturing and supply of the specified products.
2. Verify product compliance with federal, state, and local regulations.

B. Manufacturer's Qualifications:

1. Waterproofing Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 - a. Waterproofing system shall be supplied by a Waterproofing Manufacturer with a minimum of 20 years of experience in the production and sales of waterproofing.

C. Installer's Qualifications:

1. Waterproofing Installing Contractor:
 - a. Only authorized Installing Contractor(s) shall install the waterproofing assembly.
 - b. Installing Contractor(s) must have at least three (3) years of experience in Work as described in this section.
 - c. Perform Work in accordance with the Waterproofing Manufacturer's published literature and as specified in this section.
 - d. Maintain one (1) copy of the Waterproofing Manufacturer's instructions on site.
 - e. Allow the Waterproofing Manufacturer representative site access during installation.
 - f. Contact the Waterproofing Manufacturer a minimum of two weeks prior to scheduling a meeting.

1.05. MOCK-UPS

A. Mock-ups:

1. Provide a mock-up to verify selections made under submittals and to set quality standards for materials and execution in accordance with Section.

1.06. DELIVERY, STORAGE, AND HANDLING

- #### A. Delivery of Materials:
- Deliver materials to the jobsite in undamaged and clearly marked containers and/or wrapping indicating the name of the Waterproofing Manufacturer and product.

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B. Storage of Materials:

1. Store materials as recommended by the Waterproofing Manufacturer and conform to applicable safety regulatory agencies. Refer to all applicable data including, but not limited to, SDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
2. Keep solvents away from open flame or excessive heat.
3. Store rolled materials on end.
4. Product requirements may vary. Refer to Waterproofing Manufacturer's published literature.

C. Handling: Product requirements may vary. Refer to Waterproofing Manufacturer's published literature.

1.07. SITE CONDITIONS

A. Environmental Requirements:

1. Do not perform Work during rain or inclement weather.
2. Product requirements may vary. Refer to Waterproofing Manufacturer's published literature.

B. Protection:

1. It is the responsibility of the Installing Contractor to protect all surfaces not included in scope of Work from damage.
2. It is the responsibility of the General Contractor to organize and protect installed waterproofing components from damage by other trades.

C. Complete preparation Work prior to installing the waterproofing assembly.

1.08. WARRANTY

A. Single Source Warranty:

1. Installing Contractor Warranty:

- a. Installing Contractor must warrant the installation; provide material and labor costs for repair in the event of a leak as a result of faulty workmanship for a period of two (2) years from the date of Substantial Completion.

2. Manufacturer's Single Source Warranty:

a. Material warranty:

1. Installing Contractor must be an authorized Installing Contractor.
2. Manufacturer must warrant the material against product defect for a period of ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01. MANUFACTURERS

- A. The Basis of Design for this system is Henry Company. Approved equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

2.02. MATERIALS

Obtain waterproofing and auxiliary materials as a single-source from the Waterproofing Manufacturer to ensure compatibility, warranty, and compliance with the following requirements:

1. Pre-applied fully bonded polypropylene sheet waterproofing membrane comprised of polypropylene film with a heat bonded dimple surfaced geotextile, used to form a mechanical and chemical bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete; having the following typical properties:

- a. Resistance to Hydrostatic Head (ASTM D5385): 231 ft. (70.4m)
- b. Puncture Resistance (ASTM E154)
- c. Lateral Migration Resistance (ASTM D5385 Modified): 231 ft. (70.4m)
- d. Lap Peel Adhesion (ASTM D1876): 6.9lbs/in (1200 N/m)
- e. Permeance (ASTM E96): <0.1 Perms
- f. Peel Adhesion to Concrete (ASTM D903): 5 lbs/in (875 N/m)

- A. Blind Side Concrete Vertical Walls: Primary Assembly Products:

1. Pre-Applied Sheet Waterproofing; choose from the following:
 - a. Pre-applied fully bonded polypropylene sheet waterproofing membrane comprised of polypropylene film with a heat bonded dimple surfaced geotextile, used to form a mechanical and chemical bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete; having the following typical properties:
 1. Basis of Design: Henry Blueskin PreSeal™ 320 or approved equal.
 2. Color: White
 3. Thickness (ASTM D37367): 32 mils (0.81mm)
 4. Resistance to Hydrostatic Head (ASTM D5385): 231 ft. (70.4m)
 5. Lateral Migration Resistance (ASTM D5385 Modified): 231 ft. (70.4m)
 6. Water Absorption (ASTM D570): 0.4%
 7. Elongation (ASTM D412): 45%
 8. Tensile Strength (ASTM D412): 1400 psi (9.7 MPa)
 9. Lap Peel Adhesion (ASTM D1876): 6.9lbs/in (1200 N/m)
 10. Puncture Resistance (ASTM E154): 110 lbs (490 N)

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11. Peel Adhesion to Concrete (ASTM D903): 5 lbs/in (875 N/m)
12. Low Temperature Flexibility (ASTM D1970): Unaffected at -20 °F (-29 °C)

B. Backfilled Vertical Wall:

1. WP-200 Sheet

- a. Primary sheet applied self-adhered waterproofing membrane shall be Blueskin® WP200 manufactured by Henry (or approved equal), 1.5mm (60 mils) SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film, and having the following physical properties:

1. Thickness: 1.5 mm (60 mils) min.
2. Flexibility: Pass @ -40 degrees C to ASTM D1970
3. Vapour permeance: 2.8 ng/Pa.s.m² (0.05 perms) to ASTM E96
4. Tensile strength (membrane): 2.24 MPa to ASTM D412,
5. Tensile strength (film): 34.5 MPa to ASTM D882,
6. Elongation: 300% to ASTM D412,
7. Puncture resistance: 222 N min. to ASTM E154.

2. PRIMER

- a. Primer for self-adhering membranes at temperatures above 25 degrees F shall be Aquatac™ Primer manufactured by Henry or approved equal, a polymer emulsion based adhesive, quick setting, having the following physical properties:

1. Color: Aqua;
2. Weight: 8.7 lbs/gal;
3. Solids by weight: 53%;
4. Water based, no solvent odours
5. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F;
6. Water Vapor Permeance (ASTM E96): <0.1 Perms

C. Underslab Horizontal:

- a. Pre-applied fully bonded polypropylene sheet waterproofing membrane comprised of polypropylene film with a heat bonded dimple surfaced geotextile, used to form a mechanical and chemical bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete; having the following typical properties:

1. Basis of Design: Henry Blueskin PreSeal™ 435 or approved equal.

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2. Color: White
3. Thickness (ASTM D37367): 43.5 mils (1.1mm)
4. Resistance to Hydrostatic Head (ASTM D5385): 231 ft. (70.4m)
5. Lateral Migration Resistance (ASTM D5385 Modified): 231 ft. (70.4m)
6. Water Absorption (ASTM D570): 0.6%
7. Elongation (ASTM D412): 70%
8. Tensile Strength (ASTM D412): 1900 psi (14.4 MPa)
9. Lap Peel Adhesion (ASTM D1876): 6.9lbs/in (1200 N/m)
10. Puncture Resistance (ASTM E154): 225 lbs (1000 N)
11. Peel Adhesion to Concrete (ASTM D903): 5 lbs/in (875 N/m)
12. Low Temperature Flexibility (ASTM D1970): Unaffected at -20 °F (-29 °C)
13. Water Vapor Permeance (ASTM E96): <0.1 Perms

D. Assembly Auxiliary Materials:

1. Waterstop; chose from the following:
 - a. Preformed adhesive hydrophilic waterstop designed to swell in the presence of water, providing a watertight seal in cold joints on concrete structures, having the following properties:
 1. Basis of Design: Henry Hydro-Flex Waterstop or approved equal.
 2. Rain or wet conditions: Swells into unconsolidated concrete surfaces upon contact with water.
 - b. Non-swelling preformed joint sealant that provides a lasting, watertight bond to both fresh and cured concrete surfaces, having the following properties:
 1. Basis of Design: Henry Synko-Flex[®] Waterstop or approved equal.
 2. Rain or wet conditions: Does not rely on swelling to achieve a watertight seal
2. Tape; choose from the following:
 - a. Double-sided, ready-to-use acrylic adhesive tape for fastening pre-applied waterproofing membranes to vertical surfaces and adhering pre-applied waterproofing membrane seams, having the following properties:
 1. Basis of Design: Henry Blueskin PreSeal™ Tape 50S or approved equal.
 2. Color: Blue Acrylic adhesive
 - b. Reinforced acrylic detailing tape used to seal pre-applied waterproofing corners, edges, penetrations and seams for vertical and horizontal applications, having the following properties:

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1. Basis of Design: Henry Blueskin PreSeal™ Tape 120V or approved equal.
2. Color: White with non-woven facer
3. Sealant:
 - a. Moisture cure, medium modulus polymer modified sealing compound, having the following typical properties:
 1. Basis of Design Product: Henry 925 BES Sealant or approved equal.
4. Drainage Composite:
 - a. Two-part prefabricated geo-composite drain board consisting of a formed polystyrene core covered on one side with a woven or non-woven polypropylene filter fabric:
 1. Basis of Design: Henry® DB200 or approved equal.

PART 3 - EXECUTION

3.01. EXAMINATION

- A. It is the Installing Contractor's responsibility to verify the substrate is in accordance with Waterproofing Manufacturer requirements and as specified in this Section prior to installation of pre-applied waterproofing. Commencement of the Work or any parts thereof, indicates installer acceptance of the substrate.
 1. Substrates must be sound and solid to eliminate movement during concrete pour.
 2. Substrates must be continuous, regular and smooth.
 3. Substrate gaps or voids: one-half (0.5) inch wide gap maximum
 4. Grout around penetrations for stability.
 5. Horizontal substrates:
 - a. Substrates must be free of loose aggregate and sharp protrusions.
 - b. Avoid curved or rounded substrates.
 - c. Installations over compacted earth or crushed stone:
 1. Verify pre-applied waterproofing is suitable for application over compacted earth or crushed stone. Refer to product specific technical data sheet.
 2. Ensure substrate is well compacted to avoid displacement due to traffic or concrete pour.

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- d. Pre-applied waterproofing can be applied to dry or damp surfaces on horizontal substrates.
 - e. Remove standing water.
6. Vertical Substrates:
- a. Provide membrane support.
 - 1. Acceptable substrates: sheet piling, concrete, plywood, insulation, drain board or other approved facing to sheet piling.
 - a. Verify pre-applied waterproofing is suitable for application directly over sheet piling where applicable. Pre-applied waterproofing membrane may require substrate preparation to create a smooth surface such as plywood or drain board.
 - b. Shuttering/formwork must be clean and free of frost, oil, grease, dirt, excess mortar, release agents or other contaminants.
7. Applications using waterstops that swell into unconsolidated concrete surfaces upon contact with water require 2" minimum concrete coverage on all sides.

3.02. PREPARATION

- A. Do not apply waterproofing components until substrate and environmental conditions are in accordance with Waterproofing Manufacturer's product specific TDS, and as specified in this Section.
- B. Surfaces must be sound, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.

3.03. INSTALLATION

- A. Verify substrate is ready to receive the waterproofing in accordance with the Waterproofing Manufacturer's TDS and guide specification.
- B. Air and substrate temperature limitations:
 - 1. Do not perform Work when ambient (air) and substrate temperatures are below 32 °F (0 °C).
- C. Detailing/Flashing:
 - 1. Install detailing and flashings per Waterproofing Manufacturer's details.

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D. Waterproofing Assembly Installation:

1. Vertical substrates:

- a. Install waterproofing membrane with polypropylene film side facing existing substrate, dimpled surface geotextile side facing the installer.
- b. Where vertical securement is required, select from the following methods:
 1. Tape:
 - a. Secure membrane with double sided tape.
 2. Mechanical attachment:
 - a. Secure membrane at selvedge with small, low profile, non-rusting, substrate appropriate fasteners to create a smooth and flat membrane seam.
- c. Verify waterproofing is clean, dry and free from contaminants prior to subsequent membrane installations; wipe with damp cloth if necessary.
- d. Overlap membrane seams two (2) inches.
- e. Remove plastic release liner at selvedge and firmly press overlapping membrane into place to adhere membrane seams.
- f. Seal membrane seams in accordance with Waterproofing Manufacturer details.

2. Horizontal substrates:

- a. Install waterproofing membrane with polypropylene film side facing existing substrate, dimpled surface geotextile side facing the installer.
- b. Extend pre-applied waterproofing twenty-four (24) inches beyond base slab to create a trafficable space and minimize membrane soiling or damage.
- c. Verify waterproofing is clean, dry and free from contaminants prior to subsequent membrane installations; wipe with damp cloth if necessary.
- d. Stagger end laps to avoid layer build up.
- e. Overlap membrane seams two (2) inches.
- f. Remove plastic release liner at selvedge and firmly press overlapping membrane into place to adhere membrane seams.
- g. Seal membrane seams in accordance with Waterproofing Manufacturer details.

E. Waterstop Installation:

1. Install waterstop in accordance with Waterstop Manufacturer requirements.
2. Refer to product specific published literature for installation instructions.
3. Applications using waterstops that swell into unconsolidated concrete surfaces upon contact with water require 2" minimum concrete coverage on all sides.

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3.04. CLEANING

- A. As the Work proceeds, and upon completion, promptly clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.
- B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.
- C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION

SECTION 07190 - VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

- A. Products supplied under this section:
 - 1. Vapor barrier, seam tape, mastic, pipe boots, detail strip for insulation under concrete slabs.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 2. ASTM E 164-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - 5. ASTM E 1643 Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. American Concrete Institute (ACI):
 - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

- A. Quality control/assurance:
 - 1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
 - 2. Manufacturer's samples, literature.
 - 3. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Vapor barrier must have all of the following qualities:
 - 1. Permeance as tested after conditioning of less than 0.03 Perms [grains/(ft² · hr · inHg)] as tested in accordance with ASTM E 1745 Paragraphs 7.1.2-5.
 - 2. Other performance criteria:
 - a. Strength: ASTM E 1745 Class A.
 - b. Minimum thickness of the plastic retarder material: 10 mils.
- B. Vapor barrier products:
 - 1. Basis of Design: Stego Wrap Vapor Barrier (10-mil) by Stego Industries LLC. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.

SECTION 07190 - VAPOR BARRIER

2.2 ACCESSORIES

- A. Seam tape:
 - 1. Stego Tape by Stego Industries LLC.
 - 2. Or approved equal.

- B. Vapor-proofing mastic:
 - 1. Stego Mastic by Stego Industries LLC.
 - 2. Or approved equal.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ensure that base material is approved by the manufacturer's recommendations.
 - 1. Level and compact base material.

- B. Pre-Construction / Installation:
 - 1. Host an onsite pre-construction / installation meeting with the Construction Manager and manufacturer's representative.

3.2 INSTALLATION

- A. Install vapor barrier retarder in accordance with manufacturer's instructions and ASTM E 1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.
 - 2. Lap vapor barrier over footings and/or in recessed haunches for a continuous installation. Seal the vapor barrier to the foundation walls.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

- B. A manufacturer's inspection prior to placing the concrete is required. Provide a field report confirming that the installation is completed per the warranty requirements and manufacturer's installation requirements.

END OF SECTION

SECTION 07200 - WATER REPELLENTS (For Brick Veneer & Concrete Masonry Unit)

1.1 GENERAL

- A. Submit Product Data for each product specified.
- B. Warranty: 5-Year Manufacturer's Authorized Warranty. The water repellent test should be done before the application to determine the material needed to coat the surface.

1.2 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - 1. BASF – Master Builders Solutions – MasterProtect H 177 for Brick
 - 2. MAB - Modac Products Company - Siloxane 40
 - 3. STO Concrete Restoration Division - STO Penetration Sealer CR650
 - 4. Chemprobe Technologies, Inc. - Chemprobe Prime-A-Pell H20 for Brick
- B. Siloxanes: Penetrating water repellent. Alkylalkoxysiloxanes that are oligomeric with alcohol, ethanol, mineral spirits, water, or other solvent carrier.
 - 1. With more than 8.3-lb/gal. (400-g/L) VOCs.
- C. Silane/Siloxane Blends: Consisting of silanes and siloxanes blended to achieve a particular penetration and protection on a specific substrate.
 - 1. With more than 8.3-lb/gal. (400-g/L) VOCs.

2.1 EXECUTION

- A. **A preconstruction on site meeting is required** with the manufacturer's representative to verify the existing conditions, moisture test and sample area completed prior to the preconstruction meeting conform to the manufacturer's installation requirements and warranty.
- B. Preparation: Clean substrate and test for moisture content according to repellent manufacturer's written instructions.
 - 1. Concrete Masonry Unit: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.
 - 2. Clay Brick Masonry: Clean clay brick masonry per ASTM D 5703.
- C. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.
- D. Protect Adjoining Work: Cover nearby surfaces of aluminum and glass. Cover live plants and grass.

SECTION 07200 - WATER REPELLENTS (For Brick Veneer & Concrete Masonry Unit)

- E. Coordination with Sealants: Do not apply water repellent until sealants have been installed and cured.
- F. Application: Apply at the end of the project after the masonry has been completed for a minimum of six (6) months. If the Substantial Completion date is prior to this, the Contractor shall re-mobilize and complete this scope following the Substantial Completion date. Comply with manufacturer's written instructions. Apply a mist coat and a heavy-saturation coat using low-pressure spray equipment. Apply a second coat per manufacturer's written instructions.
- G. Remove protective coverings from adjacent surfaces and other protected areas.
- H. Clean adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses per manufacturer's written cleaning instructions. Repair damage caused by water-repellent application.

2.2 LOCATION

- A. The following areas are to be coated by this product.
 - 1. All new brick, CMU and Cast Stone veneer work
 - 2. All existing masonry areas as shown on the Contract Drawings.

END OF SECTION 07200

SECTION 07210-BUILDING INSULATION

1.1 GENERAL

- A. Submittals: Product Data for each type of insulation product specified.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated as determined by testing identical products per NFPA 285, ASTM E 84, ASTM E 119, or ASTM E 136 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.2 PRODUCTS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thickness, widths and lengths.
- B. For below slab insulation: Extruded-Polystyrene Board Insulation: ASTM C 578 for type indicated below:
 - 1. Under Slab Type IV, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density.
- C. For masonry cavity insulation: Board Insulation: Polyisocyanurate Foam – Board Insulation: ASTM C 1289, foil faced, Type I, Class 1 or 2. Do not tape the Board joints. Leave joints open for vapor permeability.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- D. For all interior walls: Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing) of type described below:
 - 1. Mineral-Fiber Type: Fibers manufactured from glass. (3 5/8" R=13, 6" R=19).
 - 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
- E. For all Exterior Stud Walls or Attic Spaces: Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III, Class A.
 - 1. Mineral-Fiber Type: Fibers manufactured from glass. (6" R=19)
- F. For use as fire stop at openings between edge of slab and exterior wall panels: Provide a fire tested assembly where required. Slag-Wool-Fiber Board Safing Insulation: Semirigid boards designed and produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; nominal density of 4 lb/cu. ft. (64kg/cu. m); passing ASTM E 136 for combustion characteristics; thermal resistivity of 4 deg. F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

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1. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
 2. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.
- G. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of hooding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:
1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches (2.67 mm) in diameter, length to suit depth of insulation indicated.

1.3 EXECUTION

- A. Installation, General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.
1. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
 2. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 3. Apply single layer of insulation to produce thickness indicated.
 4. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.
 5. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant.
 6. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 7. Install insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
 8. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 9. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

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10. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 11. Attic insulation board should be a tight fit at the bottom of the rafters. Apply thermo-ply sheathing under insulation board to act as vapor barrier and insulation board support.
 12. In between bathroom walls and cavity walls where there is no gypsum wall board sheathing on the inside face, provide horizontal metal straps between studs at 48" on center to hold insulation in place.
- B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to written instructions of insulation manufacturer.
- C. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.
- D. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015.
- E. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

END OF SECTION

SECTION 07272 – FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this section.
- B. The Specification shall be read in its entirety by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractor the extent of their Work.
- C. Throughout this Section there is basis of design products listed. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.

1.2 SUMMARY

- A. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work as shown on the Drawings as specified herein including, but not limited to, the following:
 - 1. Adhesives/Primers
 - 2. Fluid Applied, Vapor Permeable Air & Water Barrier Membrane
 - 3. Transition Membranes
 - 4. Sealant
 - 5. Thru-wall flashing

1.3 DEFINITIONS

- A. Air barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Airbarrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Airbarrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- D. Transition Membranes has the same meaning as Transition Strips.

1.4 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AMMA 2400-02, Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction

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B. American Society for Testing and Materials (ASTM):

1. ASTM D412, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension
2. ASTM D471, Standard Test Method for Rubber Property - Effect of Liquids
3. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
4. ASTM D2243, Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
5. ASTM D5590, Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials
8. ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
9. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
10. ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
11. ASTM E1354, Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
12. ASTM E1677, Standard Specification for Air Barrier (AB) Material or System for Low- Rise Framed Building Walls
13. ASTM E2112, Standard Practice for Installation of Exterior Windows, Doors and Skylights
14. ASTM E2178, Standard Test Method for Air Permeance of Building Materials
15. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

C. National Fire and Protection Agency (NFPA):

1. NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the Work of this Section with the installation of exterior substrate. Sequence Work so that installation of fluid-applied air barrier coincides with installation of substrate preparation without causing delay to the Work.

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B. Pre-installation meetings:

1. Pre-installation Conference: Conduct conference at Project site.
2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
3. Air marrier manufacturer representative will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the assembly.

1.5 SUBMITTALS

A. ACTION SUBMITTALS:

1. Product Data: For each type of product.
 - a. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
 - b. Air barrier manufacturer's guide specification.
 - c. Air marrier manufacturer's complete set of technical data sheets for assembly.
 - d. Air marrier manufacturer's complete set of standard detail drawings.
2. Shop Drawings: For air-barrier assemblies.
 - a. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - b. Include details of interfaces with other materials that form part of air barrier.

B. INFORMATIONAL SUBMITTALS

1. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
2. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
3. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - a. NFPA 285 wall assembly compliance: Air barrier manufacturer statement that anticipated wall assembly passes NFPA 285.
4. Evaluation Reports: from ICC-ES
5. Product certification that the assembly components are supplied and warranted by single source air barrier manufacturer.

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6. Statement that installing contractor is authorized by air barrier manufacturer to complete Work as specified.
7. Statement that materials are adhesively and chemical compatible with adjacent materials proposed for use.
8. Reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
9. Letter from primary materials manufacturer indicating compatibility of products not manufactured by primary manufacturer.
10. Submit Eco-Efficiency Analysis of each material.
11. Submit recommended values for field adhesion test on each substrate.
12. Submit accreditation number of manufacturer and certification number of installers.
13. Warranty: Sample warranty as specified.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain fluid-applied membrane air barrier, transition membranes, air barrier sealants, primers, mastics, and adhesives from a single air barrier manufacturer regularly engaged in the manufacturing and supply of the specified products.
2. Contactor to verify product compliance with federal, state, and local regulations controlling use of Volatile Organic Compounds (VOC).

B. Manufacturer Qualifications:

1. The Contractor shall demonstrate qualifications to supply materials of this section by certifying the following:
 - a. Air marrier manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.

C. Installer Qualifications:

1. Perform Work in accordance with air marrier manufacturer published literature and as specified in this section.
 - a. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
2. Maintain one (1) copy of air barrier manufacturer's instructions on site.
3. At all times during the execution of the Work allow access to site by the air barrier manufacturer representative.

D. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

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- E. Preconstruction Meeting: Organize and convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Contractor is responsible for all site safety requirements. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

1.7 MOCK-UPS

- A. Construct mock-ups to verify selections made under submittals and to set quality standards for materials and execution in accordance with requirements.
- B. Mock-Ups: The Contractor is responsible for coordinating the construction of the mock-up. Mock-up shall be representative of primary exterior wall assemblies and glazing assemblies including backup wall, air-barrier assemblies and typical penetrations. Mock-up shall be approximately 8 feet long by 8 feet high and include all components in the exterior wall assembly and as indicated.
- C. Mock-Up Tests for Adhesion: Test mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and the area(s) which failed the project requirements. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met.

1.8 MANUFACTURERS QUALIFICATIONS / ALTERNATE MANUFACTURERS:

- A. The materials outlined are the type of materials to be used on this project. Please refer to Specification Section 01300, "Submittals." "Or Equal" substitutions are permitted so long as they are equal to or superior to the basis of design and the Contractor takes full responsibility for all coordination and costs associated with collateral issues related to the substitution.

1.9 PERIODIC INSPECTION BY MANUFACTURER'S REPRESENTATIVE

- A. When the project is in progress, the air barrier manufacturer shall inspect the work not less than 2 days per week. In addition, the manufacturer shall:
 - 1. Keep the architect and Owner's on-site representative informed as to the progress and quality of the work as observed.
 - 2. The Contractor shall correct any unacceptable practices in order to comply with the manufacturer's instructions.
 - 3. Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

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1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall be delivered to the jobsite in undamaged and clearly marked containers indicating the name of the air barrier manufacturer and product.

B. Storage of Materials:

1. Store materials as recommended by the air barrier manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
2. Keep solvents away from open flame or excessive heat.
3. Products should be stored in closed containers.
4. Store rolled materials on end in original packaging.
5. Protect rolls from direct sunlight until ready for use.
6. Refer to air barrier manufacturer published literature.

C. Handling:

1. Refer to air barrier manufacturer's published literature.

1.11 SITE CONDITIONS

A. Environmental Requirements:

1. No work shall be performed during rain or inclement weather.
2. No work shall be performed on frost or wet covered surfaces.

B. Protection:

1. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane.

C. Ensure all preparation Work is completed prior to installing fluid-applied membrane air barrier.

1.12 WARRANTY

- A. Provide manufacturer's exposure warranty that offers twelve (12) months of coverage against in-place exposure damage (delamination, deterioration) beginning with the date of installation of the product.
- B. Provide manufacturer's standard warranty for sheathing to be free of manufacturing defects that make it unsuitable for its intended use. Warranty period shall be Ten (10) years from the date of Purchase.

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- C. Installer’s Warranty: Provide an Installer’s Warranty for two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS MANUFACTURER

- D. Components and auxiliary materials must be obtained as a single source from the assembly the Contractor to ensure total system compatibility and integrity.
- E. Basis of Design (Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.)
 - 1. Henry Company
 - 2. Or Approved Equal

2.2 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. Primary Fluid-Applied Membrane Air Barrier (Basis of Design):
 - 1. One-component, water-based, elastomeric emulsion membrane, designed to provide a vapor permeable air and water barrier when applied above-grade wall assemblies, having the following properties:
 - a. Basis of Design Product: Air-Bloc 17MR or approved equal
 - b. Color: Graphite
 - c. Solids Content:
 - 1) By Weight: 63%
 - 2) By Volume: 53%
 - d. Service Temperature:
 - 1) Low Temperature: -40 degrees F (-40 degrees C)
 - 2) High Temperature: +180 degrees F (+80 degrees C)
 - e. Application Temperature:
 - 1) Low Temperature: +20 degrees F (-6 degrees C)
 - 2) High Temperature: +122 degrees F (+50 degrees C)
 - f. Tensile Strength (ASTM D412): 104 psi (717 kPa)
 - g. Elongation (ASTM D412): 420%
 - h. Low Temperature Flexibility @ -22 degrees F (-30 degrees C) (ASTM D1970): Pass
 - i. Freeze-Thaw Resistance (ASTM D2243): Pass; 10 cycles
 - j. Nail Sealability (ASTM D1970): Pass

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- k. VOC Content: 100 grams/liter max.
 - l. Water Absorption (ASTM D471, modified): 5.6%
 - m. Water Vapor Permeance (ASTM E96 B) @ 40 mils nominal dry film: 14 perms
 - n. Air Permeability:
 - 1) Assembly Air Leakage (ASTM E2357): Pass
 - 2) Building Material (ASTM E2178): 0.0001 cfm/ft² (0.0005 L/s.m²)
 - o. Chemical Resistance: Resists salt solutions, mild acids and alkalis. Non-resistant to oils, grease or solvents
 - p. Fire Testing (NFPA 285): Complies in various assemblies
 - q. Flame Spread/Smoke Development (ASTM E84): 10/15
 - r. Resistance to Mold, Mildew, and Fungal Growth (ASTM D5590): No growth
- C. Auxiliary Materials
- 1. Transition Membranes:
 - a. Liquid applied flashings:
 - 1) Moisture-curing one component elastomeric liquid applied flashing membrane using a highly advanced STPe (Silyl-Terminated Polyether) polymer, having the following properties:
 - a) Basis of Design Product: Air-Bloc LF or approved equal
 - b) Color: Blue
 - c) Air Leakage (ASTM E2178): <0.004 L/s/m² @ 75Pa
 - d) Water Vapor Permeance (ASTM E96, Method B): 21.8 perms @25 mils
 - e) Air Leakage of air barrier assemblies (ASTM E2357): Pass
 - f) Water Resistance (AC212/ASTM D2247): Pass
 - g) Nail Sealability (AMMA 711): Pass
 - h) Surface Burning Characteristics (ASTM E84):
 - 2) Class A
 - 3) Flame Spread/Smoke Development (ASTM E84): 20/5
 - a) Tensile Strength (ASTM D412): 132 psi
 - b) Elongation (ASTM D412): 264%
 - b. Self-Adhering flashings:
 - 1) Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt

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compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:

- a) Basis of Design Product: Blueskin SA or approved equal
- b) Color: Blue
- c) Water Vapor Permeance (ASTM E96, Method A): .86 perms
- d) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
- e) Air Leakage (ASTM E2178): <0.0005 L/s/m² @ 75Pa
- f) Water Tightness (CAN/CGSB-37.58-M86): Pass.
- g) Nail Sealability (ASTM D1970): Pass.
- h) Tensile Strength:
 - 2) Membrane (ASTM D412-modified): 500 psi minimum
 - 3) Film (ASTM D828): 5000 psi minimum
 - a) Elongation (ASTM D412-modified): 200% minimum

2. Sheathing Joint Membranes:

- a. Vapor permeable, self-adhered water resistive air barrier membrane consisting of an engineered film and patented, permeable adhesive technology with split-back poly-release film, having the following properties:
 - 1) Basis of Design Product: Blueskin VP160 or approved equal
 - 2) Color: Blue
 - 3) Air Leakage (ASTM E2178): <0.02 L/s/m² @ 75Pa
 - 4) Water Vapor Permeance (ASTM E96, Method A): 29 perms
 - 5) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - 6) Resistance to Water Penetration (ICC-ES AC 38): Pass.
 - 7) Nail Sealability (ASTM D1970): Pass
 - 8) Surface Burning Characteristics (ASTM E84):
 - a) Class A
 - b) Flame Spread/Smoke Development (ASTM E84): 0/105
 - 9) Tensile Strength (ASTM D828): 182N MD/129N CD
 - 10) Cycling and Elongation (ICC-ES AC48): Pass

3. Adhesives and Primers:

- a. Spray adhesive, and having the following properties:
 - 1) Basis of Design Product: Blueskin Spray Prep or approved equal
 - 2) Color: Clear amber
 - 3) Solids Content (By Weight): 35%
 - 4) Aerosol

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- b. Polymer emulsion based adhesive type, quick setting, low VOC content, having the following properties:
 - 1) Basis of Design Product: Blueskin LVC Adhesive or approved equal.
 - 2) Color: Blue.
 - 3) Solids Content (By Weight): 40%.
 - 4) Solvent based: 240 g/L.
- c. Polymer emulsion-based primer for self-adhered membranes, and having the following properties:
 - 1) Basis of Design Product: Aquatac Primer or approved equal
 - 2) Color: Aqua.
 - 3) Solids Content (By Weight): 58%.
 - 4) Water based: Maximum VOC: 50 g/l
- 4. Sealants:
 - a. Building Envelope Sealant:
 - 1) Moisture cure, medium modulus polymer modified sealing compound, having the following properties:
 - a) Basis of Design Product: HE925 BES Sealant or approved equal
 - b) Complies with Fed. Spec. TT-S-00230C, Type II, Class A.
 - c) Complies with ASTM C920, Type S, Grade NS, Class 35.
 - d) Elongation: 450 – 550%.
 - e) Remains flexible with aging.
 - b. Sheathing Joint Sealants:
 - 1) As recommended by the air barrier manufacturer
 - c. Contact the air barrier manufacturer for a complete list of authorized sealants.
- 5. Self-Adhesive Thru-Wall Flashing Membrane:
 - a. Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:
 - 1) Basis of Design Product: Blueskin TWF or approved equal
 - 2) Color: Yellow
 - 3) High Temperature Stability - Flow Resistance (ASTM D5147): Pass
 - 4) Air leakage (ASTM E283): 0.005 L/s.m² @ 75 Pa.
 - 5) Water vapor permeance (ASTM E96, Method B): 0.03 perms

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- 6) Low temperature flexibility (CGSB 37-GP-56M): Pass
6. Termination bar: stainless steel with sealant receiver.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Substrate Conditions:
 1. Verify substrates to receive work and surrounding adjacent surfaces are in accordance with Air Barrier Manufacturer published literature prior to installation of fluid applied membrane air barrier assembly.
 2. Sheathing panels must be securely fastened and installed flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer published literature.
 3. Fastener penetrations must be set flush with sheathing and fastened into solid backing.
 4. Mortar joints in concrete block and form tie holes/voids in poured concrete shall be filled, flush, smooth, and allowed to be cured for a minimum of twenty-four (24) hours.
 5. New concrete should be cured for a minimum of sixteen (16) hours after forms are removed.
 6. Cap and protect exposed back-up walls against wet weather conditions prior to application of fluid applied membrane air barrier assembly.
 7. Exterior surfaces of existing CMU walls are parged with $\pm \frac{1}{2}$ inch of portland cement mortar with a high variability of surface irregularity.
 - a. CMU and Parging Repair is described in the Drawings
- B. Notify the Owner in writing of any conditions that are not acceptable.
- C. The Contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with the manufacturer's recommendations. Commencement of work or any parts thereof shall mean acceptance of the substrate.

3.2 PREPARATION

- A. All surfaces must be sound, dry to touch, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.
- B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.
- C. Hot weather or direct-sun applications over porous substrates, such as concrete, promote rapid surface drying and can form blisters in the fluid applied membrane air barrier during curing. To aid in blister prevention prepare substrate in accordance with one of the following optional procedures:
 1. Prime coat:

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- a. Apply a thin prime coat of fluid applied membrane air barrier to substrate.
 - b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
 - c. Install primary fluid applied membrane air barrier to Air Barrier Manufacturer minimum recommended mil thickness.
2. Two coat:
- a. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
 - b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
 - c. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
 - d. Overall dry mil thickness shall be in accordance with Air Barrier Air Barrier Manufacturer published literature.

3.3 INSTALLATION

- A. Ensure substrate is ready to receive fluid applied membrane air barrier in accordance with published literature.
- B. If fluid applied membrane air barrier should freeze while in storage, move containers to a controlled environment above 32 degrees F (0 degrees C) until thawed and re-mix using a hand operated power mixer prior to use.
- C. Fluid applied membrane air barrier shall not be applied when ambient (air) and substrate temperatures are below 20 degrees F (-6 degrees C).
- D. Do not proceed with application of air barrier membrane when rain is expected within 16 hours.
- E. Apply sealant at sharp corners, changes in substrate plane, penetrations, and edges to form a smooth transition from one plane to another.
- F. Non-Moving Substrate Joint and Crack Treatment:
 1. Gaps equal to or less than 3/8 inch (10 mm) wide:
 - a. Sheathing Joint Sealant:
 - 1) Apply sealant at rate recommended by the air barrier manufacturer.
 - 2) Spread sealant at joint extending a minimum one (1) inch beyond gap to ensure a continuous air and watertight assembly.
 2. Gaps equal to or less than 1/2 inch (12 mm) wide:

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- a. Building Envelope Sealant:
 - 1) Apply sealant at rate recommended by the air barrier manufacturer.
 - 2) Spread sealant at joint extending a minimum one (1) inch on each side of substrate gap.
- b. Liquid applied flashings:
 - 1) Apply liquid applied flashing at rate recommended by the air barrier manufacturer
 - 2) Apply liquid applied flashing in accordance with the air barrier manufacturer published literature extending a minimum of two (2) inches on each side of substrate gap.
- c. Self-adhering flashings:
 - 1) Apply primer to substrate and allow curing in accordance with published literature prior to installation of self-adhered flashing.
 - 2) Apply self-adhering flashing in accordance with Air Barrier Manufacturer published literature extending a minimum of three (3) inches on each side of substrate gap.
 - 3) Roll membrane with countertop roller to eliminate air pockets between self- adhered flashing and substrate ensuring full adhesion of membrane onto substrate.
 - 4) Seal exposed leading edges of self-adhered membrane with sealant.
- 3. Gaps greater than 1/2 inch wide:
 - a. Contact the air barrier manufacturer.
- G. Refer to Drawings and air barrier manufacturer requirements for installation procedures including, but not limited to, the following:
 - 1. General:
 - a. Coordinate all requirements and notify the architect and the Owner's on site representative of conflicting direction noted. Do not proceed with the work until the conflict is resolved and written notice is given on how to proceed.
 - 2. Inside corners
 - 3. Outside corners
 - 4. Crack treatment
 - 5. Penetrations
 - 6. Rough openings
 - 7. Control joints

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8. Expansion joints
 9. Changes in substrate
- H. Contact the air barrier manufacturer to coordinate transition of fluid applied membrane air barrier to adjacent areas including, but not limited to, the following:
1. Roof to air barrier
 2. Air barrier to waterproofing
 3. Fastener penetrations
 4. Foundation and walls, including penetrations, ties and anchors.
 5. Walls, windows, curtain walls, storefronts, louvers or doors.
 6. Dissimilar wall assemblies and fixed openings within those assemblies.
 7. Wall and roof connections.
 8. Floors over unconditioned space.
 9. Walls, floor and roof across construction, control and expansion joints.
 10. Utility, pipe and duct penetrations.
 11. Seismic and expansion and control joints.
 12. Leakage pathways in the building envelope.
- I. Thru-Wall Flashing:
1. Coordinate with Section 04210 - Unit Masonry
 2. Provide drip plate as indicated.
- J. Primary Liquid Air Barrier Membrane
1. Install fluid applied membrane air barrier in accordance with the air barrier manufacturer published literature to ensure an air and watertight fluid applied membrane air barrier assembly.
 2. Fluid applied membrane air barrier assembly must be installed in a monolithic application without sags, runs or voids, and transitioning with auxiliary components to create a uniform drainage plane and air barrier.
 3. Install fluid applied membrane air barrier and transition membranes so that subsequent membrane installation laps one (1) inch (2.5 cm) onto existing membrane ensuring an air and watertight fluid applied membrane air barrier assembly.
 4. Fluid applied membrane air barrier total dry thickness shall be in accordance with air barrier manufacturer published literature. Refer to the Air Barrier Manufacturer Technical Data Sheet.

3.4 FIELD QUALITY CONTROL

- A. Final Observation and Verification:
1. Final inspection of fluid applied membrane air barrier assembly shall be carried out by the Owner's representative, the contractor, and the air barrier manufacturer representative.
 2. Contact the air barrier manufacturer for warranty issuance requirements.

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- B. Fluid applied membrane air barrier assembly is not designed for permanent UV exposure. Refer to the air barrier manufacturer published literature for product limitations.

3.5 CLEANING

- A. Promptly as the work proceeds, and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.
- B. Clean soiled surfaces, spatters, and damage caused by the installation.
- C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION

SECTION 07410 - PREFORMED METAL ROOFING PANELS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Work described in this section includes preformed metal roofing system complete with clips, perimeter and penetration flashing and closures. They are to be provided by the roof manufacturer and painted to match.
- B. The roof system is to be installed over steel deck with self-adhering underlayment, with the panels attached via concealed clips secured to deck.
- C. System shall include gutters, downspouts, snow-fence, and other accessories and trim as noted on project drawings.

1.2 RELATED SECTIONS.

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Specification Sections apply to this section.

1.3 SUBMITTALS:

- A. Shop drawings: Show roofing system with flashings and accessories in plan and elevation; sections and details. Include metal thickness' and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations; existing beam locations, purlin and girt locations, thermal expansion provisions and special supports. Indicate relationships with adjacent and interfacing work. Shop drawings must be completed by the metal panel manufacturer's engineering department. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.
- B. Product Data: Include manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data and finish specifications.
- C. Design test reports:
 - 1. Indicate fastener types and spacings; and provide fastener pullout values.
 - 2. Submit copy of manufacturer's minimum design load calculations according to ASCE-7-16.
 - 3. Submit copy of certification from manufacturer stating that specified system has been tested in accordance with ASTM-1592 requirements by an independent Engineering Firm. All test results must be submitted including Air (ASTM E 283 & E 1680) and Water (ASTM E 331 & E 1646) Infiltration Tests. These test results must meet or exceed those listed in Section 1.8 (Design and Performance Criteria) and be stamped by an independent Engineering Firm.

1.4 INSTALLER QUALIFICATIONS:

- A. Engage an experienced metal roofing contractor (erector) to install metal wall system who has a minimum of five (5) years' experience specializing in the installation of structural standing seam metal roof systems.

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- B. Contractor must be certified by manufacturer specified as supplier of wall panel system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, the contractor must supply owner with a copy of this certification.
- C. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five (5) years' experience with the installation of system similar to that specified.
- D. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials if required.
- E. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The owners representative reserves the right to inspect fabrication facilities in determining qualifications.

1.5 MANUFACTURERS QUALIFICATIONS / ALTERNATE MANUFACTURERS:

- A. The materials outlined in the Material and Method Specifications are the type of materials to be used on this project. Please refer to Specification Section 01300, "Submittals." "Or Approved Equal" substitutions are permitted so long as they are equal to or superior to the basis of design and the Contractor takes full responsibility for all coordination and costs associated with collateral issues related to the substitution. No Substitutions will be reviewed during the bidding process. The Contractor takes full responsibility for all substitutions. Substitution submittals shall be made **no later than 30 days after Notice to Proceed** in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products. **No Substitutions will be considered after 30 days.** The following manufacturer criteria must be submitted with the substitution request.
 - 1. Submit certified test reports from a testing laboratory that bear the stamp of a registered P.E. to show compliance with specified performance criteria.
 - 2. Tests shall have been made for identical systems within the ranges of specified performance criteria.
 - 3. Empirical calculations for roof performance shall only be acceptable for positive loads.
 - 4. Indicate fastener types and spacings and provide fastener pullout values.
 - 5. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, address and contact telephone number.
 - 6. A written statement from the manufacturer stating that they will provide the building owner with a periodic job site inspection a minimum of three days per week by an experienced, full-time employee of the company.
 - 7. A copy of manufacturer's warranty covering both material and labor.
 - 10. A copy of manufacturer's warranty covering both material and labor for all roofing included in the contract.
- B. The following samples must be submitted by alternate manufacturers:
 - 1. Submit sample of panel section, at least 6" x 6" showing seam profile and also a sample of color selected.

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2. Submit sample of panel clip.
3. Submit sample of hat section and/or bearing plate if required.
4. Submit sample of base sheet, roll goods and/or mastics if required.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Manufacturer's responsibility:

1. Protect components during fabrication and packing from mechanical abuse, stains, discoloration, and corrosion.
2. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage, and handling.

B. Installer's responsibility:

1. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
2. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from the site.
3. Protect panels from wind-related damages.
4. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

1.7 JOB CONDITIONS:

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.

B. Protection:

1. Provide protection or avoid traffic on completed roof surfaces.
2. Do not overload roof with stored materials.
3. Support no roof-mounted equipment directly on roofing system.

C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place and approved prior to installation of roofing.

1.8 QUALITY CRITERIA:

A. Applicable standards:

1. American Iron and Steel Institute (AISI):
1986 Specification for the Design of Cold-Formed Steel Structural Members.
2. American Society for Testing and Materials (ASTM):
B209-96 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
D1056-91 Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

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- D3575-84 Test Methods for Flexible Cellular Materials made from Olefin Polymers.
 - E283-93 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - E1680-95 Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
 - E1592-95 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - E331-86 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - E1646-95 Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): 1993 Architectural Sheet Metal Manual, 5th edition.
 - 4. Underwriters' Laboratories (UL):
 - Standard UL - 580 Tests for Wind-Uplift Resistance of Roof Assemblies.
 - Standard UL - 263 Tests for Fire Resistance
 - Standard UL - 790 Class A Fire Rating.
- B. Applicable erection tolerances: Maximum variation from true planes or lines: 1/4" in 20'-0"; 3/8" in 40'-0" or more.

1.9 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an Installer who has completed the Manufacturer's Approved Roofing Contractor course and is currently certified for the installation of this roof system.
- B. If required, fabricator/installer shall submit work experience and evidence of adequate financial Responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.
- C. Source Limitations: Obtain all components of roof system from a single manufacturer, including roll goods materials if required. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer.
 - 1. Upon request of the Architect, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.
 - 2. Manufacturer shall have direct authority and control over all fabrication of steel components as well as the raw materials used in their fabrication.
- D. Source Quality Control: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001 approval.
- E. Engage the Manufacturer's Field Representative to conduct required periodic inspections of work in progress as described herein and shall furnish written documentation of all such inspections.

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- F. Manufacturer shall provide a site inspection 3 days per week that the project is being constructed as specified, by an experienced, full time employee of the company.

1.10 DESIGN AND PERFORMANCE CRITERIA:

A. Thermal Movement:

- 1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
- 2. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
- 3. Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved and designed per job conditions by specified manufacturer.

B. Uniform wind load capacity:

- 1. Installed roof system shall withstand positive and negative design wind loading pressures complying with roof system manufacturer's wind uplift calculations:
 - a. Design Code: ASCE 7-16
 - b. Importance Factor: III
- 2. Capacity shall be determined using pleated airbag method in accordance with ASTM E 1592, testing of sheet metal roof panels as follows:
 - a. Roof test specimens shall be either full length or representative of the main body of the roof, free from edge restraint or perimeter attachments, continuous over one or more supports, and containing at least five panel modules for standing seam roof.
 - b. No attachments shall be permitted at sides or end perimeter other than those that occur uniformly throughout roof. Side and end seals shall be flexible and in no way restrain crosswise distortion of panels.
 - c. Panels and accessories shall be production materials of same type and thickness proposed for use on project.
- 3. Installed roof system shall carry positive uniform design loads with a maximum system deflection of L/180 as measured at the rib (web) of the panel.

C. ASTM E283: Static pressure air infiltration:

Pressure	Leakage Rate
1.57 PSF	0.0007 cfm/sq.ft.
6.24 PSF	0.0002 cfm/sq.ft.
20.0 PSF	0.0036 cfm/sq.ft.

D. ASTM 1680: Standard Test Method For Rate Of Air Leakage Through Metal Roof Panel Systems:

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Pressure	Area Leakage Rate	Seam Leakage rate
1.57 PSF	0.0012 cfm/sq.ft.	0.0012 cfm./ l.f.
6.24 PSF	0.0000 cfm/sq.ft.	0.0001 cfm./ l.f.
20.0 PSF	0.0011 cfm/sq.ft.	0.0011 cfm./ l.f.

E. ASTM E331: Static pressure water infiltration:

Pressure	Result
5 Gal/Hr Per S.F. and Static Pressure Of 20.0 Psf for 15 minutes Leakage	No

F. ASTM 1646: Standard Test Method for Water Penetrations of Exterior Metal Roof Panels by Uniform Static Air Pressure Difference:

Pressure	Result
5 Gal/Hr Per S.F. and Static Pressure Of 20.0 Psf for 15 minutes	No Leakage

G. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.

H. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

1.10 WARRANTIES:

- A. Owner shall receive one (1) warranty from manufacturer of membrane roofing, roof panels, and wall panels. Multiple warranties are not acceptable.
 - 1. Manufacturer's 30 year watertight warranty covering all components of the installed standing seam system.
 - 2. 30 year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.
 - 3. Warranty shall commence on date of substantial completion.
 - 4. Installer shall provide manufacturer with 5 year warranty covering roofing system installation and watertightness.

PART 2 - PRODUCTS

2.1. METAL ROOF SYSTEM:

A. BASIS OF DESIGN

- 1. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an

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alternate material and/or system will only be considered if the proposed alternate is submitted on time and is documented as being equivalent or superior in quality to the specified system as described in these specifications. Additionally, all manufacturer and contractor /fabricator guidelines must be met as specified.

- a) The Garland Company, Inc.
- b) Tremco
- c) Approved Equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

2. Product names for the metal roof panel system and waterproofing materials used in this section shall be based on performance requirements from materials manufactured by The Garland Company and form the basis of the contract documents.

B. PANEL MATERIAL

1. Steel, G-90 Galvanized, smooth as per ASTM A 653, 24 gauge thickness
2. Flashing and flat stock material: Fabricate in profiles indicated on drawings of same material, thickness, and finish as roof system, unless indicated otherwise.
3. Nominal width 16” for roof panel

C. FINISH ON SURFACES:

1. Exposed surfaces for coated aluminum:
 - a. Two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator.
 - b. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
 - c. Color shall be selected by the Owner / Architect from manufacturer's standard colors

D. CHARACTERISTICS:

1. Configuration, Roofing: Standing seams incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.
 - a. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
 - b. Profile of panel shall have mesa's every 1 1/2” o.c. continuous throughout panel which are a minimum of 1.5” wide. These will absorb thermal stresses, reduce oil canning in panel and increase load carrying capacity.
 - c. Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at trim details (as per manufacturer's guidelines)

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- d. Panels must be furnished in continuous lengths from eave to eave with no overlaps unless approved by manufacturer to length of run.
2. Seam must be 2-3/8" minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are not acceptable.
3. Concealed Anchor Clips: Clips must be 16 gauge, stainless steel, alloy 316L, ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
 - a. Two-piece (2) clips are NOT acceptable.
 - b. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraction.
 - c. Clip must maintain a clearance of a minimum of 3/8" between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.
4. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet according to job condition and field seamed by means of manufacturer's standard seaming machine.
 - a. Cap shall be designed to receive continuous double bead of hot applied, foamed in place gasketing sealant which will not come in contact with the anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.
 - b. Sealant shall be non-fatigue, nitrogen injected water barrier.
5. Standing Seam Panel Width: (16")
6. Stiffening ribs, mesas: Located in flat of panel to minimize oil canning and telegraphing of structural members.
7. Panel length: Full length without joints, including bends.
8. Replaceability: Panels shall be of a symmetrical design with snap on cap configuration such that individual panels may be removable for replacement without removing adjacent panels.
9. Panel ends shall be panned at ridge, headwall, and hip conditions where applicable.

2.2 ACCESSORY PRODUCTS:

- A. Sealant:
 1. Acceptable product:

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- a. Concealed Application : Tuff-Stuff or approved equal.
 - b. Exposed Application : General Electric Co., SILGLAZE II 2800 or approved equal.
2. Colors: As selected by architect from sealant manufacturer's standard selection.
- B. Closures: Factory pre-cut closed cell foam meeting ASTM D 1056 or ASTM D 3575, enclosed in metal channel matching panels when used at hip, ridge, rake, or jamb.
- C. Gutters:
1. Continuous length box gutter, dimensions as noted on drawings
 2. .050 aluminum
 3. Internal hangers and fascia brackets
 4. Provide gutters fabricated by Garrety Manufacturing or approved equal
- D. Fasteners
1. Blazer ¼-14 HWH for clip attachment to structure.

2.3 FABRICATION:

- A. Shop fabricate metal roofing and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.
- B. Form flashing components from full single width sheet in minimum 10'-0" sections. Provide mitered corners, joined using closed end pop rivets and joint sealant.
- C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

2.4 SNOW FENCE SYSTEM DESCRIPTION

- A. Roof Attachment Clamps: Provide aluminum standing seam roof clamp. Carbon steel or plastic parts are not acceptable. No fastener penetrations of the roof membrane will be permitted. No systems that rely on adhesives for attachment will be permitted. Clamp to attach to the standing seam will have three stainless steel set screws (3/8" minimum diameter) having rounded point.
- B. Crossmember: S-5! "ColorGard" extrusion with receptacle in face to provide for insert of color strip. Color strip is to be the same prefinished material and originate from the same supplier as the roof panels. Crossmember is to be continuous and include splice connectors to join adjacent sections, ensuring alignment and structural continuity. Cross member is attached to clamps using 3/8" diameter stainless steel bolts.
- C. Snow/ Ice Clips: Mandatory on panel seam heights of 2" or greater. Furnish only if shown on plans for panel seam heights below 2" S-5! "SnoClips" are to be aluminum or stainless steel, with rubber "foot". Clip to attach to cross member and rest on panel flat, between panel seams to retard movement of snow/ice beneath crossmember. Use two

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clips per panel for seam spacing of 16" or more; one clip per panel for seam spacing under 16".

- D. Clamps and VersaBracket: Manufactured from certified 6061 T6 extruded aluminum, in strict conformity with The Aluminum Association, Incorporated "Aluminum Standards and Data" and ASTM standard B-221. Cast parts are not permitted.
- E. Crossmember: Manufactured from certified 6061 T6 aluminum, in strict conformity with The Aluminum Association, Incorporated "Aluminum Standards and Data" and ASTM standard B-221. Minimum breaking strength of 175 pounds per linear inch. Crossmember must be furnished with splice pieces to align adjacent sections and maintain continuity.
- F. Color Strip
 - 1. Steel : Aluminum-Zinc Alloy Coated, ASTM A792, Coating Designation AZ-50, in thickness of .0217 or .0336 by min. 36 in. by coil, chemically treated, commercial lock-forming quality.
 - 2. Steel Finishes: Fluorocarbon, epoxy primer baked both sides, as approved by finish coat manufacturer:
- G. Fasteners and Other Hardware: Each Clamp is to be secured to the panel seam with a minimum of three set screws, having nominal diameter of 0.375". Set screws are to have a round nose point to prevent damage to the panel finish. Cup point set screws are not acceptable. Set screws and other clamp hardware is to be either 300 series stainless steel (18-8 alloy) having no iron content, or aluminum. Attachment bolt for clamp is to be 0.375" diameter with washer. One row of snow fence required for this project.

PART 3 EXECUTION OF WORK

3.1 PREPARATION:

- A. Inspection: Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the preformed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.
- B. Establish straight side and crosswise benchmarks.
- C. Use proper size and length fastener for strength requirements. Approximately 5/16" is allowable for maximum fastener head size beneath the panel.
- D. Rectangular Roofs shall be checked for square and straightness. Gable ends may not be straight; set a true line for the gable clips and flashing with stringline.
- E. Measure the roof lengthwise to confirm panel lengths, overhangs, coverage of flashings at eaves and ridges and verify clearances for thermal movement.

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- F. Purlin sections must correspond with the clip spacings outlined in section 1.10B. Attach according to manufacturer's recommendations for resisting the calculated uplift pressures.
- G. Pre-roofing conference: Prior to beginning metal roofing work, a pre-roofing conference shall be held to review work to be accomplished.
 - 1. Architect, Owner, contractor, metal roofing subcontractor, metal roofing system manufacturer's representative and all other subcontractors who have equipment penetrating roof or whose work involves access to roof shall be present.

3.2 ROOFING AND FLASHING INSTALLATION:

- A. All details will be shown on manufacturer's shop drawings to successful bidder; install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.
- B. Attach the 16 gauge one piece panel clips with two fasteners per clip according to the proper spacing specified above. The clips are to be attached to the metal framing.
- E. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.
 - 1. A stainless steel pop rivet shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located at the ridge of the system. This is done at each arm of the clip along the ridge. The panel is then anchored at both sides of the clip.
 - a. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
 - 2. The seam caps are shipped with two rolls of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end. Caps come in 45' lengths maximum
 - 3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels
 - 4. Caps shall then be permanently seamed with manufacturers mechanical seamer.
- F. Limit exposed fasteners to extent indicated on shop drawings.
- G. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

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- H. Seal laps and joints in accordance with roofing system manufacturer's product data.
- I. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual.
- K. Provide for temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.
- L. Installed system shall be true to line and plane and free of dents, and physical defects with a minimum of oil canning.
- M. Form joints in linear sheet metal to allow for 1/4" minimum expansion at 20'-0" o.c. maximum and 8'-0" from corners.
- N. At joints in linear sheet metal items, set sheet metal items in two 1/4" beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.
- O. Remove damaged work and replace with new, undamaged components.
- P. All vent stacks must be a minimum of 10" above the finished roof surface. Do not use copper or other incompatible materials. Paint all metal stacks and copper counterflashing with manufacturer's recommended coating to prevent rust and other harmful byproducts from affecting panel finish.

3.3 SNOW FENCE INSTALLATION

- A. Layout: Carefully lay out desired assembly locations true-to-line prior to installing clamps or Versabrakets. Clamps shall avoid panel attachment clips if the clip is a single piece design.
- B. Clamp Installation: Assemble set screws to clamp and clamp to seam following all manufacturers printed instructions. Both set screws are to be at the same side of clamp. When application relies upon tested load-to-failure values, manufacturer's minimum recommended set screw tension shall be randomly verified using calibrated torque wrench per manufacturer's instructions.
- C. System Installation: Install snow retention assemblies straight and true-to-line. Secure all color strip material to ColorGard per manufacturer's instructions. Join adjacent sections with splice pieces provided. Do not cantilever crossmember more than 6" past the last clamp in an assembly.

3.4 CLEANING AND PROTECTION:

- A. Remove protective film (if any) from exposed surfaces of metal roofing, promptly upon installation. Strip with care to avoid damage to finishes. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.
- B. Provide final protection in a manner acceptable to installer, which ensures metal roofing being without damage or deterioration at time of substantial completion.

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- C. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

END OF SECTION

SECTION 07412 – ALUMINUM COMPOSITE METAL WALL PANELS

PART 1 - GENERAL

1.1 SCOPE

A. Section Includes

1. The extent of panel system work is indicated on the drawings and in these specifications.
2. Panel system requirements include the following components:
 - a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
 - b. Parapet coping, column covers, soffits, sills, border, and filler items indicated as integral components of the panel system or as designed.
 - c. Interior panel system work that basically matches exterior panel system work.

B. Related Documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Technical Specification Divisions 2 through 16 apply to this Section.

1.2 QUALITY ASSURANCE

A. Quality Assurance Requirements

1. Composite Panel Manufacturer shall have a minimum of 5 years experience in the manufacturing of this product.
2. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.
3. Fabricator/installer shall be acceptable to the composite panel manufacturer.
4. Fabricator/Installer shall have a minimum 5 years experience of metal panel work similar in scope and size to this project.
5. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.
6. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.
7. Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.

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8. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.
9. Composite panel manufacturer shall have established an Installer Certification Program which by the installation company is pre-qualified.

1.3 REFERENCES

A. Aluminum Association

1. AA-C22-A41: Anodized - Clear Coatings.
2. AA-C22-A42: Anodized - Integral Color Coatings.

B. American Architectural Manufacturers Association

1. AAMA 508-05: Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

C. American Society For Testing And Materials

1. E 330 Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads
2. E 283 Rate of Leakage through Exterior Windows, Curtain Walls, and Doors
3. D 1781 Climbing Drum Peel Test for Adhesives
4. E 84 Surface Burning Characteristics of Building Materials
5. D 3363 Method for Film Hardness by Pencil Test
6. D 2794 Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
7. D 3359 Methods for Measuring Adhesion by Tape Test
8. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
9. B 117 Method of Salt Spray (Fog) Testing
10. D 822 Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products
11. D 1308 Effect of Household Chemicals on Clear and Pigmented Organic Finishes
12. D 1735 Method for Water Fog Testing of Organic Coatings.
13. D 1929 Standard Test Method for Determining Ignition Temperature of Plastics
14. D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

1.4 SUBMITTALS

A. Submittals shall be in conformance with Section 01300 - Submittals.

B. Samples

1. Panel System Assembly: Two samples of each type of assembly. 304mm (12") x 304mm (12") minimum.

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2. Two samples of each color or finish selected, 76mm (3”) x 102mm (4”) minimum.
- C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.
- D. Affidavit Certifying Material Meets Requirements Specified.
- E. Two copies of manufacturer’s literature for panel material.
- F. Provide a certification letter from the composite panel manufacturer stating that the installer is qualified perform this job specific project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect finish and edges in accordance with panel manufacturer’s recommendations.
- B. Store material in accordance with panel manufacturer’s recommendations.

PART 2 - PRODUCTS

2.1 PANELS

- A. Composite Panels
 1. The Basis of design is ALUCOBOND material manufactured by Alcan Composites USA, Inc.
 2. Approved equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.
- B. Thickness: 4MM
- C. Product Performance
 1. Bond Integrity:
 - a. When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values:
 - b. Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured, 115 N mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F
 2. Fire Performance :
 - a. ASTM E 84 Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.
 - b. ASTM D 1929 A self ignition temperature of 650°F or greater
 - c. ASTM D-635 Requires a CC1 classification

SECTION 07412 – ALUMINUM COMPOSITE METAL WALL PANELS

D. Finishes

1. Coil coated KYNAR[®] 500 or HYLAR[®] 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene – Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605. Approved equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.
 - a. Color: Standard color as selected by the owner / architect / engineer from manufacturer's standard color palette.
 - b. Coating Thickness: Colors - 1.0 mil (±0.2 mil).
 - c. Hardness: ASTM D-3363; HB minimum using Eagle Turquoise Pencil.
 - d. Impact:
 - 1) Test method: ASTM D-2794; Gardner Variable Impact Tester with 5/8" mandrel.
 - 2) Coating shall withstand reverse impact of 1.5"/pounds per mil substrate thickness.
 - 3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
 - e. Adhesion:
 - 1) Test Method: ASTM D-3359.
 - 2) Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
 - f. Humidity Resistance
 - 1) Test Method: ASTM D-2247.
 - 2) No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
 - g. Salt Spray Resistance:
 - 1) Test Method: ASTM B-117; Expose coating system to 4000 hours, using 5% NaCl solution.
 - 2) Corrosion creepage from scribe line: 1/16" max.
 - 3) Minimum blister rating of 8 within the test specimen field.
 - h. Weather Exposure
 - 1) Outdoor:
 - a. Ten-year exposure at 45° angle facing south Florida exposure.
 - b. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.
 - c. Maximum chalk rating of 8 in accordance with ASTM D-4214.
 - d. No checking, crazing, adhesion loss.

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i. Chemical Resistance:

- 1) ASTM D-1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
- 2) ASTM D-1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
- 3) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.

2. Urethane Coating: For small quantity aluminum accent panels or custom color applications, provide a multi coat urethane finish in accordance with the paint manufacturer's requirements.

2.2 PANEL FABRICATION

- A. Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. Aluminum Face Sheets:

1. Thickness: 0.50mm (0.0197") (nominal)
2. Alloy: AA3000 Series (Painted material) AA5000 Series (Anodized material)

C. Panel Weight:

1. 4mm (0.157"): 1.12 lbs./ft²

D. Tolerances

1. Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.
2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
4. Maximum deviation from panel flatness shall be 1/8" in 5'0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

E. System Characteristics

1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their

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details and characteristics comply with size and profile requirements, and material/performance standards.

2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System shall comply with the applicable provisions of the “Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual” by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

F. System Type

1. The Basis of Design shall be AMD Series 2000 rout and return dry joint system.
2. Approved equal systems will be considered in accordance with Section 01300 – Submittals.

G. System Performance

1. Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.

a. Wind Load – 95 MPH

If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.

Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed $L/175$ or $3/4$ ”, whichever is less.

Normal to the plane of the wall, the maximum panel deflection shall not exceed $L/60$ of the full span.

Maximum anchor deflection shall not exceed $1/16$ ”.

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At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16”.

b. Air/Water System Test

If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Air Infiltration - When tested in accordance with ASTM E283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft² of wall area.

Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331.

c. Pressure Equalized Rain Screen Systems shall comply with AAMA 508-05 Voluntary

Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

H. ACCESSORIES

1. Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the recommendations of the manufacturer.
2. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
3. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
4. Fabricate flashing materials from 0.030” minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
5. Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

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PART 3 - EXECUTION

3.1 INSPECTION

- A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
- B. Surfaces to receive panels shall be structurally sound as determined by a registered Architect/Engineer.

3.2 INSTALLATION

- A. Erect panels plumb, level, and true.
- B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.
- C. Panels shall be erected in accordance with an approved set of shop drawings.
- D. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- E. Conform to panel fabricator's instructions for installation of concealed fasteners.
- F. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.
- G. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.
- H. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- I. Installation must be performed by a prequalified installation firm from the fabricator.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the Contract.
- B. Repair panels with minor damage.

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- C. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the Contract.
- D. Any additional protection, after installation, shall be the responsibility of the Contract.
- E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- F. Final cleaning shall not be part of the work of this section.

END OF SECTION

SECTION 07530 – EPDM ROOF

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. JM EPDM NR FIT Fully adhered roof system or Elevate Roofing, Lining and Wall Systems RubberGard Platinum EPDM™ Fully Adhered Roofing System or approved equal.
 - 2. Roof expansion assemblies.
 - 3. Roofing Insulation.
 - 4. Cover Board
 - 5. Roof flashings and counter flashings.
 - 6. .090 non-reinforced EPDM roof membrane
 - 7. Walkways.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install a watertight, EPDM roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.
 - 1. Roofing system shall comply with the following:
 - a. 100 mile per hour wind speed in 3 second gusts.
 - b. IBC 2021 building code compliance, NJ edition
 - c. ASCE 7-16 Design Criteria

1.4 SUBMITTALS

Provide one complete roof system shop drawing with an index, table of contents, and all related products.

- A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:
 - 1. Base flashings and membrane terminations.
 - 2. Flat and tapered insulation, including finished slopes at a minimum ¼” per foot.
 - 3. Crickets, saddles, and tapered edge strips, including slopes.
- C. Samples for Verification: Of the following products:

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1. 12-by-12-inch (300-by-300-mm) square of non-reinforced EPDM
 2. 12-by-12-inch (300-by-300-mm) square of roofing insulation.
 3. 12-by-12-inch (300-by-300-mm) square of walkway pads.
 4. 6 insulation fasteners of each type, length, and finish.
 5. Flashing and counter flashing.
- D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, and licensed by manufacturer to install specified roofing system and is eligible to receive the no dollar limit roofing manufacturer's warranty.
- E. Manufacturer Certificates: Signed by roofing system manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of complying with requirements.
- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.
- H. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project from a model code organization acceptable to authorities having jurisdiction.
- I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.
- J. Warranty: Sample copy of no dollar limit roofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty. Provide sample of the Installer's Warranty.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report and a qualified independent testing agency's report of completed roof installation.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, and licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the no dollar limit roofing manufacturer's warranty.
- B. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-16 Design Criteria.

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- C. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.
1. Meet with Owner; Construction Manger; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing installer; roofing system manufacturer's representative; deck installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods of removing the existing roofing and cover board. Examine existing roof deck structure, slope and area of replacing roofing for daily output.
 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
 5. Review loading limitations of deck during and after roofing.
 6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 7. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
 10. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
 11. Review all roofing openings, sizes, location, curb or post supports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weather tight location to ensure no significant moisture pickup and maintain at a temperature exceeding roofing system manufacturer's written instruction. Store membrane and other sheet materials on pallets or other raised surfaces under a waterproof cover.
1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.
- B. Do not leave unused membrane and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F (10 deg C).
- C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

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1. Insulation shipping wrap is not weather protection. Provide additional weather protection of insulation materials complying to manufacturer's written instruction and PIMA technical bulletin # 109.

1.7 INSTALLER QUALITY ASSURANCE

- A. The Owner has determined that it would be in the best interest of this particular project, and reasonably related to the specific work to be performed, that all bidders be required to participate in an approved apprenticeship program pursuant to standards established under the Department of Wage and Industry Act of 1948 (N.J.S.A. 34:1A-34 et. seq. Please fill out and include the "Apprenticeship Form for Construction Projects" which is included in the Specifications with your Bid Documents.
- B. The EPDM membrane roofing system must achieve a UL Class A.
- C. Materials: All materials and adhesives must comply with New Jersey and local requirements limiting volatile organic compounds (VOC).
- D. The manufacturer must have a minimum of 30 years experience in the manufacturing of vulcanized thermal set sheeting.
- E. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.
- F. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least five (5) years successful experience installing single-ply EPDM roofing systems and having installed at least one (1) roofing application or several similar systems of equal or greater size within one year.
- G. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and experienced superintendent on the job at all times roofing work is in progress.
- H. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the Owner. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.
- I. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.
- J. The roofing system manufacturer will provide, when the project is in progress, the following:

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1. Keeping the Owner informed as to the progress and quality of the work as observed.
2. Provide job site inspections a minimum of four days per week.
3. Reporting to the Owner in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirming, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported.

1.8 JOB CONDITIONS, CAUTIONS AND WARNINGS

- A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.
- B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
- C. When loading materials onto the roof, the Manufacturer's Licensed Contractor must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.
- D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.
- E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- F. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters. Blue EPS board may be used In lieu of plywood.
- G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.
- H. New roofing shall be complete and weathertight at the end of the work day.
- I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.9 WARRANTY

- A. Roofing Manufacturer's Warranty: Provide a 30-year Platinum no dollar limit leak proof labor and material warranty by the roofing manufacturer from the date of substantial completion following approval by the roof manufacturer's agent.

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The single source warranty shall include all roofing system products, all edge/coping metal products and all wall panels. The maximum wind speed coverage shall be peak gusts of 100 mph measured at 10 meters above ground level. Certification is required with the shop drawing submittal indicating the manufacturer has reviewed and agreed to such wind coverage. Warranty shall also include Manufacturer's coverage for accidental puncture for the duration of the 30 year warranty.

- B. Installer's Warranty: Submit installer's warranty letter, signed by the Installer, covering work of this section, including all roofing system components and all metal components for two (2) years from the date of Substantial Completion following approval by the roof manufacturer's agent.
- C. Pro-rated System Warranties shall not be accepted.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All components of the specified roofing system shall be products of Johns Manville (JM) or Elevate Roofing, Lining and Wall Systems or approved equal.
- B. Unless otherwise approved by the specifier and accepted by the membrane manufacturer, all products (including insulation, fasteners, fastening plates and edgings) must be **manufactured and supplied** by the roofing system manufacturer and covered by the warranty.

2.2 MEMBRANE

- A. Furnish JM EPDM NR 90 mil - FIT non-reinforced EPDM or Elevate RubberGard 90 mil RubberGard Platinum™ Non-Reinforced EPDM. (Ethylene, Propylene, Diene Terpolymer) or approved equal in the largest sheet possible. The membrane shall conform to the minimum physical properties of ASTM D4637, type 1. When a 10-foot-wide membrane is to be used, the membrane shall be manufactured in a single panel with no factory splices to reduce splice intersections. Approved equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

2.3 INSULATION MATERIALS

- A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: Rigid, cellular Polyisocyanurate thermal insulation complying with ASTM C 1289, Class 1, Grade 2 (20 PSI) classified by facer type as follows:
 - 1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
Finished slope is to be 1/4":12"
Minimum thickness drains 3.5".

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2. Minimum long term thermal resistance (LTTR): 5.7 per inch determined in accordance with CAN/ULC 770 @ 75 degrees F.
 3. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated or required for sloping to drain. No standing water shall be permitted and the Contractor shall provide this insulation as necessary.
- C. Cover Board: ASTM C 1289, Type II, Class 4, Grade 1. ½” High-Density Polyisocyanurate Foam Core, or manufacturer’s approved cover board for the roof system.
1. Product: JM ProtectoR HD, ½” High-Density Polyiso Cover Board, Elevate ½” ISO Guard or approved equal.

2.4 ADHESIVES AND CLEANERS

All products shall be furnished by Johns Manville (JM) or Elevate Roofing, Lining and Wall Systems or approved equal and specifically formulated for the intended purpose.

- A. Bonding Adhesive: JM LVOC Membrane Adhesive or Elevate Single Ply LVOC Bonding Adhesive (or approved equal).
- B. Splicing Cement: Splice Adhesive
- C. Splice Tape and Primer: JM EPDM 4” Seam Tape Plus with Tape Primer (Low VOC) or Elevate QuickSeam 3” Tape and LVOC QuickPrime+ (or approved equal).
- D. Cleaning Solvent: JM Weathered Membrane Cleaner or Elevate Clear Splice Adhesive (or approved equal).
- E. External seam sealant: JM Single-ply LVOC caulk or Elevate Lap Sealant (or approved equal).
- F. Sealer: Pourable Sealer
- G. Reinforced Termination Strip: JM EPDM reinforced termination strip with tape (RTS) (or approved equal).

2.5 FASTENERS AND PLATES

To be used for mechanical attachment of insulation and to provide additional membrane securement:

- A. Insulation Fastening Plates: a 3 inch diameter FM approved metal plate used for insulation attachment in conjunction with Heavy Duty Fastener must achieve a minimum pullout of 300 pounds for fully adhered roof systems. Comply with

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manufacturer's recommendations for minimum quantity of pull out tests.

- B. Seam Fastening Plates: A 2 inch diameter FM approved metal plate meeting corrosion resistance provisions in FMG 4470, designed for fastening membrane to substrate and acceptable to the membrane roof system manufacturer.
- C. QuickSeam RPF Strip: a 6 inch wide, 100 foot long strip of RubberGard reinforced EPDM membrane.

The 6 inch wide QuickSeam shall be utilized horizontally or vertically (in conjunction with Seam Fastening Plates) below the EPDM membrane for additional membrane securement.

2.6 METAL EDGING AND MEMBRANE TERMINATIONS

- A. JM Presto-Tite Edge One Fascia or Elevate AnchorGard (or approved equal): a metal fascia system with an extruded aluminum anchor bar and 0.050 inch thick aluminum fascia. Metal fascia color shall be as designated by the Owner's Representative or to match existing.
- B. JM Presto-Lock Coping or Elevate Coping (or approved equal): incorporates a 20 gauge galvanized steel anchor clips with 4 , a concealed joint cover and 10 foot continuous sections of coping cap. Metal coping cap color shall be as designated by the Owner's Representative.
- C. Manufacturer's Termination Bar: a 1 inch wide and .106 inch thick extruded aluminum bar pre-punched 6 inches on center; incorporates a sealant ledge to support AP Sealant and provide increased stability for membrane terminations.
- D. All metal coping / edge system to meet ANSI / SPRI ES-1 wind design standard.

2.7 WALKWAYS

- A. Protective surfacing for roof traffic shall be provided by the manufacturer, factory formed, nonporous, heavy duty, slip resistant surface textured walkway pads sourced from the roofing system manufacturer. The pad shall be installed in accordance with the manufacturer's installation requirements to resist wind blow off. Provide walk pads from the roof access point or hatch to each mechanical unit and around each mechanical unit in accordance with the equipment service requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

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- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
 - 1. Verify that wood nailer strips are located perpendicular to roof slope and are spaced according to requirements of roofing system manufacturer.
- D. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.5 mm) out of plane.
- E. Verify that all abandoned equipment, dunnage, vents, pipes, pitch pockets, etc. have been removed and the deck patched.

3.2 PREPARATION

- A. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast. Verify that all roof drains are connected to roof drainage system.
- B. Inspect the deck to verify integrity. Bring any areas of questionable integrity to the Architect's attention. Do not cover any areas of questionable welds or deck out of plane.

3.3 INSULATION AND COVER BOARD INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roofing insulation. Do not install more cover board than can be covered with roofing material the same day.
- B. Comply with membrane roofing system manufacture written instructions for installing insulation.
- C. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- D. Install new tapered insulation crickets where designated but between all drains and scuppers.
- E. Mechanically fasten common fastener through tapered insulation system and base layer insulation to roof deck using proper manufactures fasteners to comply with 2021 IBC NJ Edition and ASCE 7-16 Design Criteria but not less than the following:

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1. Fasten at the rate of 16 fasteners per 4' x 8' in the field of the roof, 24 fasteners per 4' x 8' in the perimeter of the roof and 32 fasteners per 4' x 8' in the corner of the roof.
- F. Adhere Cover board: Install cover board and secure to tapered system insulation using twin pack adhesive.
1. Adhere the bead spacing at the rate of 12" apart in the field for a 4' x 4" board, 6" apart in the perimeter for a 4' x 4' board and 4" apart in the corner for a 4' x 4' board on the roof

3.4 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.
- B. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing.
- C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- D. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.5 MEMBRANE PLACEMENT AND BONDING

- A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.
- B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
 2. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

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- C. Install adjoining membrane sheets in the same manner, overlapping edges approximately 4 inches. Do not apply bonding adhesive to the splice area.

3.6 MEMBRANE SPLICING (Factory Applied Tape Splice)

- A. Overlap adjacent sheets and mark a line out from the top sheet as recommended by roof manufacturer.
- B. Fold the top sheet back and clean the dry splice area of membrane sheet with Sure-Seal Primer as required by the membrane manufacturer.
- C. Position 4” JM Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch.
- D. Install additional 6” EPDM Peel & Stick Sealing Strip over seam as outlined in the manufacturer’s 30 year detail requirements.
- E. Remove the release film and press the top sheet onto the tape using hand pressure.
- F. Roll the seam toward the splice edge with a 2 inch wide steel roller.

3.7 FLASHING

- A. Wall and curb flashing shall be cured EPDM membrane. Mechanically fasten 6” wide Strip at 12” on center in accordance with manufacturer’s recommendations. Continue the deck membrane as wall flashing where practicable.
- B. Follow manufacturer's Platinum flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.8 WALKWAYS

- A. Install walkways at all traffic concentration points such as roof hatches, access doors, rooftop ladders, etc. Provide walk pads from the roof access point or hatch to each mechanical unit and around each mechanical unit in accordance with the equipment service requirements.
- B. Install walk pads to the EPDM membrane in accordance with the manufacturer’s requirements to resist wind blow-off.

3.9 DAILY SEAL

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the workday, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Manufacturer’s Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

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3.10 PROTECTION AND CLEANING

- A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.
- C. Protect roofing system from damage and wear during remainder of construction period.
- D. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 FIELD QUALITY CONTROL

- A. The roofing contractor shall employ and pay for a qualified inspection agent for daily inspection work for this project while the on-site work is being completed, **3 days per week minimum or daily as required for the warranty to be provided**. A weekly report shall be emailed weekly to the CM, Architect and Owner for their records. See Specification Section 01400, Quality Control for details.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to the CM, Architect and Owner.
 - 1. Notify Construction Manager (if applicable), Architect and Owner 48 hours in advance of the date and time of inspection.
- C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner:
 - 2. Address:
 - 3. Building Name/Type:
 - 4. Address:
 - 5. Area of Work: As per the Construction Documents.
 - 6. Acceptance Date:

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- 7. Warranty Period: Thirty (30) years
- 8. Expiration Date:

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 100 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 - 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
 - 3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
 - 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 - 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled

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surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 07530

SECTION 07620 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

- A. Provide all labor, equipment, and materials to fabricate and install the following.
 - 1. Edge strip and flashing.
 - 2. Expansion joint and area divider covers.
 - 3. Copings, fascia, trim and edge metal.
 - 4. Gutters and downspouts.
- B. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction. A four (4) hour time limit shall be given from the time of notification of emergency conditions. In the event of water penetration during rain or a storm, the Contractor shall provide for repair of the building contents and interior including, but not limited to, all interior contents, furnishings, equipment, building systems and finishes. If the Contractor does not respond or cannot be contacted, the Owner will affect repairs or emergency action and the Contractor shall be back charged for all expenses and damages.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.
 - 2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
 - 3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 5. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
- B. Warnock Hersey International, Inc., Middleton, WI (WH)
- C. Factory Mutual Research Corporation (FMRC)
- D. Underwriters Laboratories (UL)
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 1. Architectural Sheet Metal Manual

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- F. National Roofing Contractors Association (NRCA).
 - 1. Roofing and Waterproofing Manual
- G. Single Ply Roofing Institute (SPRI).
 - 1. Wind Design Guide for Use with Low Slope Roofing

1.4 SUBMITTALS FOR REVIEW

- A. Product Data:
 - 1. Provide manufacturer's specification data sheets for each product.
 - 2. Metal material characteristics and installation recommendations.
 - 3. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.
- B. Samples: Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.
- C. Shop Drawings:
 - 1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
 - 2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
 - 3. Indicate type, gauge and finish of metal.
- D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

1.5 SUBMITTALS FOR INFORMATION

- A. Design and Test Reports: Provide the following certified test reports from an independent testing laboratory:
 - 1. Independent laboratory testing report for system design load and seam integrity.
 - 2. Professional engineer's documentation that system incorporates sufficient allowance for stress and movement.
 - 3. A letter from an officer of the manufacturing company certifying that the materials furnished for this project are the same as represented in tests and supporting data.
 - 4. Manufacturer's verifications that the panels are factory roll-formed.
 - 5. UL 1897: Test report must be submitted for windstorm rating no less than that specified in Design and Performance Criteria article. The proposed roof system must have approval over specified substrate with steel framing spaced no further apart than as specified.
- B. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.

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- C. Qualification Data for Installer. Refer to Quality Assurance Article below.
- D. Certification of work progress inspection. Refer to Quality Assurance Article below.
- E. Certifications:
 - 1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
 - 2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.6 CONTRACT CLOSEOUT SUBMITTALS

- A. General: Comply with Requirements of Section 01700 – Contract Closeout.
- B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.
- C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.
- D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.7 QUALITY ASSURANCE

- A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years' experience.
- B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of five (5) years' experience with the installation of similar system to that specified.
- C. Source Limitation: Obtain components from a single manufacturer. Secondary products which cannot be supplied by the specified manufacturer shall be approved in writing by the primary manufacturer prior to bidding.
- D. Upon request fabricator/installer shall submit work experience and evidence of financial responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

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- C. Prevent contact with materials which may cause discoloration or staining.

1.9 PROJECT CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal edge system.

1.10 DESIGN AND PERFORMANCE CRITERIA

- A. Thermal expansion and contraction:
 - 1. Completed metal edge flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
- B. ANSI/SPRI ES-1 tested and approved.

1.11 WARRANTIES

- A. Owner shall receive one (1) warranty from manufacturer of roofing materials covering all of the following criteria. Multiple warranties are not acceptable.
 - 1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.
 - 2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for warranty(ies).
 - 3. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.
 - 4. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.
 - 5. Installing roofing contractor shall be responsible for the installation of the edge metal system in general accordance with the membrane manufacturer's recommendations.
 - 6. Installing contractor shall certify that the edge metal system has been installed per the manufacturer's printed details and specifications.
 - 7. One manufacturer shall provide a single warranty for all accessory metal for flashings, metal edges and copings, along with the warranty for metal roof areas, membrane roof areas, and any transitions between two different material types.

SECTION 07620 – SHEET METAL FLASHING AND TRIM

PART 2 PRODUCTS

2.1 PRODUCTS, GENERAL

- A. Refer to Division 01 Section “Common Product Requirements.”
- B. Basis of Design: Materials, manufacturer’s product designations, and/or manufacturer’s names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.
- C. Substitutions: Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.
 - 1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
 - 2. Include a list of three (3) projects of similar type and extent, located within a one-hundred-mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner’s Representative.
 - 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 - 4. The Owner’s decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 ACCEPTABLE MANUFACTURERS

- A. The design is based upon sheet metal flashing and trim systems engineered and manufactured by or approved equal:
 - 1. Provide edge metal components manufactured by roofing system manufacturer.

2.3 MATERIALS

- A. General: Product designations for the materials used in this section shall be based on performance characteristics of the R-MER Edge Coping and R-Mer Force Fascia Systems manufactured by the Garland Company, or approved equal and shall form the basis of the contract documents. Substitutions will be approved in accordance with Specification Section 01300.
- B. Materials:
 - 1. Exposed base metal material:
 - a. Exposed base metal material for copings, fascia, and trim components: Aluminum, ASTM B209, alloy 3105-H14, in thickness of .050” nom.

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2. Unexposed base metal material:
 - a. Flash-less Snap-On Fascia Extruded Base Anchor and Anchor Splice Plates: 6005A-T61 extruded aluminum
 3. Components for Flashless metal edge system
 - a. Compression Seal for top of anchor: TPE thermoplastic elastomer.
 - b. Sealant for Flange: Single-component high performance 100% solids, interior and exterior polyether joint sealant
 4. Minimum gauge of aluminum to be .050 minimum and as specified in accordance with Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractor's National Association, Inc. recommendations.
- C. Coping
1. Cover and Splice Plate: .050" aluminum with concealed 6 inch splice plates.
 2. Anchor Chair: 16 gauge G-90 galvanized steel.
 3. ANSI/SPRI ES-1 approved.
 4. FM certified assemblies.
- D. Scuppers and Downspouts
1. All exposed collector boxes and downspouts to be post painted, color to match perimeter edge metal or as selected by architect.
 2. Scupper collector boxes minimum .063 aluminum. All joints welded.
 3. Downspouts to be 4"x 4" x .125 extruded aluminum.
 4. Through-wall scupper sleeves shall be 16 oz lead coated copper, with integral flashing flange, fabricated to fit contour and profile of roof/wall at location of scupper opening. All joints shall be fully soldered or welded.
- E. Gutters: Field roll formed in continuous lengths between downspout locations.
1. Aluminum, ASTM B209, alloy 3105-H14, in thickness of .050" nom.
 2. Gutter Straps: 0.125" nom.
 3. Gutter Hangers: 0.25" nom.
 4. Sealant: Single component 100% solids polyether joint sealant.
- F. Finishes:
1. Exposed surfaces for coated panels:
 - a. Steel Finishes: fluorocarbon finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer. Weathering finish as referred by National Coil Coaters Association (NCCA).

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<u>Property</u>	<u>Test Method</u>	<u>Fluorocarbon*</u>
Pencil Hardness	ASTM D-3363 NCAA II-2	HB-H
Bend	ASTM D-4145	O-T NCAA II-19
Cross- Hatch	ASTM D-3359	no loss of adhesion
Gloss (60° angle)	ASTM D-523	25+/-5%
Reverse Impact	ASTM D-2794	no cracking or loss of adhesion
Nominal Thickness	ASTM D-1005	
primer 0.2 mils		
topcoat 0.8 mils		
TOTAL 1.0 mils		

*Subject to minimum quantity requirements

- b. Include optional Aluminum Anodized finish for all exposed metal to match existing finishes.
 - c. Finish color to be selected by Owner from Manufacturer’s full range of standard and premium color options.
2. Exposed and unexposed surfaces for mill finish flashing, fascia, and coping cap, shall be as shipped from the mill.

2.4 RELATED MATERIALS AND ACCESSORIES

- A. Metal Primer: Zinc chromate type.
- B. Plastic Cement: ASTM D 4586
- C. Sealant: Specified in Section 07920 or on drawings.
- D. Underlayment: ASTM D2178, No15 asphalt saturated roofing felt.
- E. Fasteners:
 - 1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
 - 2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.
- F. Downspout are to be 4” x 4” x 1/8” aluminum with welded joints and miters post painted to match the perimeter edge metal or a color selected from the standard color chart.

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- G. Downspout Anchorage Devices. See drawings for location of attachment (spaced at 6' on center maximum) and material type.
- H. Metal trim for miscellaneous detailing .050 mill finished aluminum or kynar or approved equal finished to match selected coping, gutter, or edge metal colors.
- I. Scupper boxes are to be welded and post painted.
- J. Expansion joints: .050 aluminum steel sheet metal formed to allow for expansion as shown on drawings or approved equal. Ends to be closed and sloped to meet perimeter metal.

PART 3 - EXECUTION

3.1 EXECUTION, GENERAL

- A. Refer to Division 07 Section Common Work Results for Thermal and Moisture Protection.

3.2 PROTECTION

- A. Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.

3.3 GENERAL

- A. Secure fascia to wood nailers at the bottom edge with a continuous cleat.
- B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, and manufacturer's recommendations whichever is the most stringent standard.
- C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.
- D. Allow sufficient clearances for expansion and contraction of linear metal components.
- E. Secure metal using fasteners as required by the system. Exposed face fastening will be rejected.

3.4 INSPECTION

- A. Verify that curbs are solidly set and nailing strips located.
- B. Perform field measurements prior to fabrication.
- C. Coordinate work with work of other trades.

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- D. Verify that substrate is dry, clean and free of foreign matter.
- E. Commencement of installation shall be considered acceptance of existing conditions.

3.5 MANUFACTURED SHEET METAL SYSTEMS

- A. Furnish and install manufactured fascia, fascia extender and coping cap systems in strict accordance with manufacturer's printed instructions.
- B. Provide factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc. Refer to Source limitation provision in Part 1.

3.6 SHOP-FABRICATED SHEET METAL (ACCESSORY TRIM)

- A. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices. Fabricate scuppers as shown of drawing
- B. Hem exposed edges.
- C. Angle bottom edges of exposed vertical surfaces to form drip.
- D. Lap corners with adjoining pieces fastened and set in sealant.
- E. Install sheet metal to comply with referenced SMACNA and NRCA standards.

3.7 FLASHING MEMBRANE INSTALLATION

- A. Through Wall Scupper
 - 1. Install lead coated copper scupper box in a one-quarter (1/4) inch bed of mastic. Assure all box seams are soldered and have minimum four (4) inch flange. Make sure all corners are closed and soldered.
 - 2. Prime metal edge at a rate of one-hundred (100) square feet per gallon and allow to dry.
 - 3. Fabricate scupper cover to wrap new lead coated copper scupper boxes on the outside. See detail for exact requirements
- B. Flash-less Snap-On Fascia Detail with Extruded Aluminum Base Anchor
 - 1. Position base ply of the Modified Roofing membrane over the roof edge covering nailers completely, fastening eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations. Cap sheet shall stop at the edge of the roof and shall not turn over the edge of the nailer.
 - 2. Prior to installing the base anchor, assure a level plane is present. If not, shim the roof edge surface as required.
 - 3. Extruded base anchor: Apply two 1/4" beads of Green-Lock Sealant XL or approved equal on the bottom surface of the top flange of the extruded anchor.
 - 4. Set the extruded anchor on the edge and face fasten through pre-punched slots every 18 inches o.c. for 5.75 inch face fascia, and 18 inches o.c. staggered for any fascia size greater than 5.75 inches. Begin fastening 6 inches from ends.

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5. Install Green-Lock Sealant XL or approved equal at the ends of the base frame to prevent water from running between base anchor joints.
6. Install compression seals every 40 inches on center in the slots located at the top of the extruded anchor.
7. Install fascia cover setting the top flange over the top flange and compression seals of the base anchor. Assure compression seals are in place during this process. Beginning on one end and working towards the opposite end, press downward firmly (do not rotate) until “snap” occurs and cover is engaged along entire length of miter.
8. Install splice plate at each end of the base anchor and fascia cover prior to the installation of the next adjacent ten-foot piece.

C. Slip Flashing / Counterflashing Detail

1. Install new slip flashing under existing metal and terminate with fasteners 8” on center incorporating neoprene washers.
2. All slip flashing shall be fabricated to mirror the substrate to which they are attached and include a hemmed drip edge.
3. Install new stainless-steel counterflashing manufactured for use in the existing reglet and snap into place

D. Pitch Pocket

1. All pitch pockets are to be fabricated a minimum of 4” high and shall be fabricated from 16 oz. copper, lead coated copper or stainless. All pitch pockets shall have closed corners and be soldered. Field soldering is required for the fourth corner.

E. Coping Detail

1. Install miters first.
2. Position base flashing of the Built-Up and/or Modified Roofing membrane over the wall edge covering nailers completely, fastening eight (8) inches on center. Install membrane and cap sheet with proper material and procedure according to manufacturers’ recommendations.
3. Install minimum twelve (12) inch wide anchor chair at 30” on center.
4. Install 8” wide splice plate by centering over 12” wide anchor chair. Apply two beads of sealant to either side of the splice plate’s center. Approximately 2” in from the coping cap joint. Install Coping Cap by hooking outside hem of coping on outside face of anchor chair. Press downward on inside edge of coping until “snap” occurs and hem is engaged on the entire chair.

F. Gutters & Downspouts

1. Gutter material: .050” aluminum, color to match copings and fascia
2. Gutters are to be continuous length
3. Gutter brackets are to be a minimum 3/16” x 1” aluminum.
4. Gutters are to be supported by brackets spaced 36” on center. Gutters shall be further supported by spacers every 36” and spaced alternately with the brackets
5. 4’ x 4” x 1/8” aluminum downspouts welded and post painted are to be attached to the structure a minimum of 6’ on center or as detailed on the drawings

SECTION 07620 – SHEET METAL FLASHING AND TRIM

6. Drip edge to be .050 aluminum, kynar (or approved equal) finished matching color, to be set in a bed of asphalt roof cement and nailed every 6” on center in two rows, staggered “W” pattern. Prime flange with specified asphalt primer. Strip in flange with modified base flashing ply and modified cap sheet, set in specified adhesive.

3.8 CLEANING

- A. Clean installed work in accordance with the manufacturer’s instructions.
- B. Replace damaged work than cannot be restored by normal cleaning methods.

3.9 CONSTRUCTION WASTE MANAGEMENT

- A. Remove and properly dispose of waste products generated. Comply with requirements of authorities having jurisdiction

3.10 FINAL INSPECTION

- A. The Contractor shall inspect the work and flashing of roof penetrations, walls, curbs and other equipment. The Contractor shall provide a list all items requiring correction or completion and furnish copy of list to the Construction Manager and the Architect.
- B. The Contractor shall repair or replace deteriorated or defective work found at the time of the above inspection as required to a produce an installation which is free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.
- C. The Contractor shall notify the Architect and Construction Manager upon completion of corrections.
- D. Following the final inspection, the Contractor shall provide written notice of acceptance of the installation from the roofing system manufacturer with its Project Closeout documents.

3.11 DEMONSTRATION AND TRAINING

- A. At a time and date agreed to by the Owner, instruct the Owner’s facility manager, or other representative designated by the Owner, on the following procedures:
 1. Troubleshooting procedures.
 2. Notification procedures for reporting leaks or other apparent roofing problems.
 3. Maintenance.
 4. The Owner’s obligations for maintaining the warranty in effect and force.
 5. The Manufacturer’s obligations for maintaining the warranty in effect and force.

END OF SECTION

SECTION 07720 - ROOF ACCESSORIES

1.1 GENERAL

- A. Submittals: Per Conditions of Contract and Division 1.
- B. Product data for each type of product specified.
- C. Shop drawings showing fabrication and installation of each roof accessory specified.
- D. Samples representing color, texture, shape, and sizes of each roof accessory specified.

1.2 PRODUCTS

- A. Prefabricated Curbs and Equipment Supports: Comply with loading and strength requirements for units supporting other work. Coordinate with equipment to be supported.
 - 1. Fabricate of structural-quality, hot-dip galvanized or galvalume sheet steel, factory-primed and prepared for painting with welded or sealed mechanical corner joints.
 - 2. Provide complete with cant strips and base profile coordinated with roof insulation thickness. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing as indicated, tapered as necessary to compensate for roof deck slopes.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Curbs, Inc.
 - b. Custom Curb, Inc.
 - c. The Pate Co.
 - d. Roof Products and Systems Corp.
 - e. ThyCurb Div./ThyBar Corp.
 - f. Or approved equal.
- B. Galvanized Steel Sheet: ASTM A 526 G 90 (ASTM A 526M, Z 275), commercial quality, or ASTM A 527, G 90 (ASTM A 527M, Z 275), lock-forming quality, hot dipped galvanized, mill phosphatized where indicated for painting; not less than 0.0396 inch (1.0 mm) thick, unless otherwise indicated.
- C. Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the items indicated.
- D. Roof Hatches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Babcock-Davis Hatchways, Inc.
 - b. Bilco Company
 - c. Bristolite Skylights
 - d. Custom Curb, Inc.
 - e. Dur-Red Products, Inc.
 - f. Goeller Enterprises

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- g. Hi Pro International, Inc.
 - h. J. L. Industries, Inc.
 - i. Metallic Products Corporation
 - j. Milcor, Inc.
 - k. Nystrom Products Co.
 - m. Precision Stair Corporation
 - n. Roof Products & Systems Corp.
 - o. ThyCurb, Inc.
 - p. Trimco, Inc.
 - q. Wasco Products, Inc.
 - r. or approved equal
2. General: Frame with minimum 12-inch high, integral-curb, double-wall construction with 1-1/2 inch (38-mm) insulation, formed cants and cap flashing (roofing counterflashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1-inch-(25mm) thick insulation core. Provide gasketing and equip with corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior padlock hasps, and both interior and exterior latch handles.
- a. Fabricate units to withstand 40-lbf/sq. ft. (1.9-kPa) external and 20-lbf/sq. ft. (0.95-kPa) internal loading pressure.
3. Single-Leaf Personnel Hatches:
- a. Size: As indicated 30 x 42 inches for ladder access.
 - b. Material: Manufacturer's standard
 - c. Baked-Enamel Finish: Manufacturer's standard two-coat thermocured system.
 - (i) Color and Gloss: As selected from manufacturer's full range.
4. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per foot (1:48), fabricate hatch curbs with height tapered to match slope to level tops of units.
- E. Roof Hatch Safety Railing System: Provide for all existing roof hatches. Provide size to fit on all hatches by Nesea Corp or approved equal.
- 1. Product Model#: RHSR-SS or approved equal
 - 2. Product Description: Roof Hatch Safety Railing System for safe egress and ingress through roof type access hatches and for protection of roof opening while roof hatch is up. Meets OSHA Standard CFR 29 1910.23 and CFR 29 1910.27.
 - 3. Product Selection Criteria: For roof hatches such as 2'6" x 3" and with hatchway ladder mounted on 2'6" side of hatch opposite of hatch lid hinge.
 - 4. Type of Installation: Permanent bolt on installation of right and left handed railings, guard railings, mid railings and chain as per supplied instructions and hardware.
 - 5. Materials:
 - a. Flat bar: 2" x 3/8" thickness A36 mild steel.
 - b. Pipe: 1 1/4" ID A53 Grade B seamed steel.
 - c. Weld filler: Metal NR211 E70XX (AWS).
 - d. Finish: Galvanized (hot dipped).
 - e. Chain System: 3/16" proof coil ASTM specification, zinc plated with quick links and 2 1/2" zinc plated hoops on each end.

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- f. Pipe caps: weather and light resistant vinyl 1 ½" deep and to fit snugly over pipe ends.
 - g. Bolts and washers: Hex head bolts 3/8" x 2 ½" grade Z, zinc plated.
Fender washers for inside of hatch curb and standard flat washers outside.
 - h. Railing clamps: Kee Klamp or approved equal manufactured models 10-7 and 45-7 for 1 1/4" pipe.
6. Sealant for Brackets: Brackets shall be sealed per roof manufacturer's approved methods.
7. Labels: Safety no hoisting warning label, model and serial # label, manufacturer identification label, patent or patent pending label.
8. Warranty: 5 years manufacturer's parts only warranty.
9. Manufacturer: Nesea Corporation, JL Industries Incorporated, Nystrom Co., Babcock-Davis or approved equal.
- F. Baked Enamel Finish: Thermosetting-modified acrylic enamel primer and topcoat system complying with AAMA 603.8, except with a minimum dry film thickness of 1.5 mils, medium gloss.
1. Color: As selected by Architect/Owner.
- G. Roof Access Ladder:
1. Ladders shall be detailed and submitted for approval prior to fabrication. Full dimensions, wall and floor attachments, materials, construction and finish must be shown and comply with all safety orders pertinent to the installation.
 2. Furnish and install ladder model code 502 TUBULAR RAIL LOW PARAPET ACCESS LADDER WITH ROOFOVER RAIL EXTENSIONS and model 532 CAGED TUBULAR RAIL LOW PARAPET ACCESS LADDER WITH ROOFOVER RAIL EXTENSIONS as manufactured by O'Keeffe's Inc. or approved equal, at locations shown on drawings.
 3. Rungs shall be no less than 1-1/4" in section and 18-3/8" long, formed from tubular aluminum extrusions, alloy 6063-T6 and shall be squared and deeply serrated on all sides. Rungs shall be able to withstand a 1,000 pound load without failure.
 4. Channel Side Rails, shall be no less than 3/8" wall thickness by 3" wide.
 5. Heavy Duty Tubular Side Rails, shall be assembled from two interlocking aluminum extrusions no less than 3/8" wall thickness by 3" wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
 6. Walk-Through Rail and Roof Rail Extension, shall extend no less than 3'-6" above the landing and shall be fitted with deeply serrated, square, tubular grab rails.
 7. Finish shall be clear anodized aluminum.
 8. Installation shall be according to manufacturer's recommendations.

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9. Guaranteed against defects in material and workmanship for five years.

H. Expansion Joint Covers:

1. General: Provide units fabricated specifically for required applications. Provide prefabricated corner units, joint intersection units, splicing units, adhesives, coatings, and other components as recommended by joint unit manufacturer for a complete installation.
2. Metal-Flanged Elastic-Sheet Joint System: Provide continuous units consisting of exposed elastic sheet over foam bellows, with both inside and outside stainless steel nailing flanges, either plain or angle-formed to fit curbs as required. Bellows insulated from below with adhesively-applied, closed-cell, flexible, rubber or plastic insulation not less than 5/16 inch thick, adhered to elastic sheet.
3. Acceptable Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Metalastic-CMF or approved equal.

I. Gutters and Downspouts:

1. Provide gutters and downspouts in shapes and sizes indicated, with mitered and welded corners. Include steel straps formed from at least 0.028-inch-thick, galvanized steel sheet; hangers or other attachment devices; screens; end plates; and trim and other accessories indicated or required for complete installation.
2. Additional Features: Provide items below fabricated from the same metal as gutters and downspouts.
 - a. Downspout starters (fascia sump) with downspout starter hole.
 - b. Provide gutters and downspouts fabricated from the following metal:
 - c. Formed-aluminum sheet in thickness indicated, but not less than the following: Thickness: 0.063 inch.

1.3 EXECUTION

- A. Installation: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units. Coordinate with vapor barriers, roof insulation, roofing and flashing installation to ensure that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses, as well as inward and outward loading pressures.
 1. Except as otherwise indicated, install roof accessory items according to construction details of NRCA "Roofing and Waterproofing Manual."
- B. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 07720

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Preconstruction field test reports.
- D. Compatibility and adhesion test reports.
- E. Product test reports.

1.4 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

SECTION 07920 - JOINT SEALANTS

- C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
 - 2. All test samples shall be approved and accepted by the Owner, Architect, Construction Manager and Manufacturer's field inspection personnel. Coordinate work and testing schedule with Manufacturer's field inspection personnel.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Installers five (5) year workmanship warranty from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles or approved equal.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.

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- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Single-Component Neutral-Curing Silicone Sealant for all exterior and interior joints application except as listed for other applications:
 - 1. Products:
 - a. Dow Corning Corporation; 790.
 - b. Tremco; Spectrem 1 (Basic).
 - c. Or approved equal.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 100/50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - 6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
 - 7. Paintable surface.
- F. Single-Component Neutral-Curing Silicone Sealant for structural glazing and aluminum framing:
 - 1. Products:
 - a. Dow Corning Corporation; 795.
 - b. Tremco; Spectrem 2
 - c. Or approved equal.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

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6. Paintable surface.

G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant for all interior wet areas including all ceramic tiles:

1. Products:

- a. Pecora Corporation; 898.
- b. Tremco; Tremsil 200 White.
- c. Or approved equal.

2. Type and Grade: S (single component) and NS (nonsag).

3. Class: 25.

4. Use Related to Exposure: NT (nontraffic).

5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

2.4 ACOUSTICAL JOINT SEALANTS – For all interior paintable gypsum / wood joints.

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:

- a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
- b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- c. or approved equal.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission for concealed gypsum / wood joints.

1. Products:

- a. Pecora Corporation; BA-98.
- b. Tremco; Tremco Acoustical Sealant.
- c. or approved equal.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at

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temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
 - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 2. Remove laitance and form-release agents from concrete.
 - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply

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primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
 - 4. Complete sealant all the way of the full joint length, everywhere.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

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- G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.
- H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- I. Conditions that should be avoided when working with Silicone Building Sealant:
 - 1. **DO NOT** “wet tool” with solvents or soaps as this can inhibit the surface of this sealant, the rest of the sealant bulk may cure normally but the surface will remain tacky and gummy indefinitely.
 - 2. **DO NOT** apply this sealant to a backer rod that is contaminated with solvent or primer.
 - 3. **DO NOT** apply this sealant to a surface that has been cleaned with a solvent or primer.
 - 4. **DO NOT** apply this sealant to EPOXY containing surfaces (unless they have been tested by The Americas Construction Test Lab) since they can inhibit the cure.
- J. Do not use silicone sealant for:
 - 1. Below-grade applications.
 - 2. Surfaces to be immersed in water for prolonged time.
 - 3. Brass and copper surfaces.
 - 4. Materials bleeding oils, plasticizers, and solvents.
 - 5. Structural glazing and adhesive.
 - 6. Surfaces to be painted.
 - 7. Surfaces in direct contact with food.
 - 8. Medical and pharmaceutical applications.
- K. Do not apply in totally confined spaces without ventilation for curing.

END OF SECTION 07920

SECTION 08100 – FRP FIBERGLASS DOORS

1.0 GENERAL DESCRIPTION

- A. **WORK INCLUDED:** The fiberglass doors and aluminum sub-frames required for this work are indicated on the drawings and include, but is not necessarily limited to:
 - 1. The installation of new opening systems that include aluminum sub-frames, fiberglass doors, fiberglass panels, door hardware and glass.
 - 2. Only wide stile fiberglass doors are to be used.

1.1 QUALITY ASSURANCE

- A. **MANUFACTURER’S CERTIFICATION:** Manufacturer is to have a minimum of 10 years experience in the production of pre-installed hardware and pre-assembled door systems, using the type of materials specified for this project.
- B. **DISSIMILAR METALS:** Wherever aluminum is in contact with steel, concrete or other materials potentially creative of electrolytic action, provide all required permanent isolation of the aluminum by back painting with first-quality bituminous paint.
- C. **INSTALLER’S QUALIFICATIONS:** For the installation of the entrance systems, use only mechanics who are thoroughly trained and experienced in the skills required and who are completely familiar with the manufacturer’s recommended methods of installation plus the requirements of this work.
- D. **WARRANTY:**
 - 1. System manufacturer will guarantee THE ENTIRE SYSTEM FOR A PERIOD OF 10 YEARS.
 - 2. The Fiberglass doors are guaranteed for 10 YEARS AGAINST CORE RELATED PRODUCT FAILURE.
 - 3. Warranties are to be in writing and MUST be submitted before final invoices for payment will be reviewed.

1.2 TESTING AND PERFORMANCE REQUIREMENTS

- A. Entrance systems to be supplied and installed that will comply with requirements for system performance characteristics as determined by the testing methods listed.
- B. Copies of recent test reports must accompany the Product Data Submittal package, the reports required for this project are as follows:
 - 1. Thermal Performance Test
 - 2. Structural Performance Test
 - 3. FRP Face Sheet Test
- C. Thermal Performance for complete Door and Frame Entry System:
 - 1. Thermal Transmission: U-value of not more than 0.28,BTU/HR-FT-F per AAMA 1503.1-1988.

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- 2. Air Infiltration: Not more than 0.26 CFM/FT, per ASTM E283-91.

D. FRP FACE SHEETS AND CORE PERFORMANCE:

- 1. Materials to be tested in accordance with (per ASTM E84) Ratings will be as follows: (per ASTM E84-79a)

	FLAME SPREAD	SMOKE DEVELOPED
<u>FRP EXTERIOR</u> (Class C)	145	345
<u>FRP INTERIOR</u> (Class A)	10	320
<u>POLYSTYRENE CORE</u>	15	125

- 2. IMPACT STRENGTH OF FRP Face Sheets-per ASTM D256-Izod Impact Strength, Maintains 95% of physical Flexural Strength after 30 months of outdoor exposure. 13.5
- 3. Barcol Meter Hardness test on FRP Face Sheets-not more than 50, per ASTM D2583.
- 4. COLOR RETENTION of FRP Face Sheets-Color will not change more than 5.0 DE units after exposure to 500,000 Langleys.

1.3 MANUFACTURERS

- A. ACCEPTABLE MANUFACTURERS: The products outlined in this specification are not the exclusive property of any one manufacturer. However, it should be noted that the manufacturers, listed in this specification, will have to make some modifications to their standard products, and, that new dies and designs may be required to adhere to the demands of this specification.

Products are to be from FRP Architectural Doors, Inc Series Heavy Wall FD55. Fire Rated FRP Doors Series FR45/60/90. Other acceptable manufactures provided they adhere to specification are Curries Assa/Abloy or approved equal. FRP doors must incorporate Kemlite RFP face sheet with extended U/V protection or approved equal.

1.4 SUBMITTALS

A. PRODUCT DATA:

- 1. Submit manufacturer's technical data for each type stile classification of door. Include all frame sections, elevations and details.
- 2. Include details of: Main frame corner joint construction on doors, stile and rail size, core material, vision lite moldings, louvers and factory finishing specifications.

SECTION 08100 – FRP FIBERGLASS DOORS

3. Submit two samples of each door stile classification that shows rails, stiles, core, joint construction, edge trim and closer reinforcing.
 4. Submit manufacturer of FRP face sheets.
- B. TEST REPORTS: Two copies of current test reports are to be included with the submittals.
- C. SHOP DRAWINGS: Submit signed and sealed shop drawings and calculations by a NJ registered professional engineer for the fabrication and installation of the Doors and Frames, and associated components of the work. Include wall elevations and detail sections of every typical composite member. Show frame anchoring, frame repairs to existing frames, glazing details, interior and exterior wall repairs and any other component or accessory required to complete each door opening.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. IDENTIFICATION: Each door and frame will be tagged with a mark or number which correlates with designation system used for shop drawings.
- B. PROTECTION: All materials will be protected during transit and storage from soiling and deterioration.

2.0 DOORS, FRAMES AND PANELS

2.1 CLASSIFICATIONS OF DOOR SYSTEMS, FRAMES AND PANELS:

- A. Door systems for this project are based on the following stile classification. Pre-approved manufacturers who have a standard product offering in that classification are listed.
- B. Classifications are as follows:
- FRP Architectural Doors, Inc Series Heavy Wall FD55. Fire Rated FRP Doors Series FR45/60/90. Other acceptable manufactures provided they adhere to specification are Vale V600, Curries Assa/Abloy or approved equal.

2.2 MATERIALS

- A. ALUMINUM MEMBERS:
1. Doors, sub-frames, miscellaneous components and entrance systems accessories are to be **by the same manufacturer**.
 2. Provide alloy and temper as recommended for resistance to corrosion and color control. Aluminum member references are ASTM B 221 for extrusions and ASTM B 209 for sheets.

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2.3 ALUMINUM FRAMES & CLADDING:

- A. Refer to Storefront Specification Section 08411 for door frame requirements including signed and sealed shop drawings and calculations.
 - 1. VERTICAL MEMBERS-All sub-frames will be full height of opening.
- B. ALUMINUM COLOR FINISH: As specified in Storefront Specification Section 08412.

2.4 FIBERGLASS (FRP) FACE SHEETS

- A. THICKNESS AND COLOR:
 - 1. FRP face sheets will be .120 minimum thickness with a pebble-like surface with aluminum or galvanized steel backing sheet to meet current IBC code requirements. Face sheets shall be manufactured by Kemlite with extended UV protection or approved equal.
 - 2. COLOR shall be selected from the full range of available manufacturer's options.

2.5 FIBERGLASS (FRP) PANELS

A. ALUMINUM EDGED FIBERGLASS (FRP) PANELS:

- 1. CONSTRUCTION: Panels will be constructed of two sheets of .120 fiberglass sheets bonded to 3/4" core material. Panel thickness will be 1-3/4". A 1-3/4" x 2" x 1/8" wall thickness aluminum frame surrounds the perimeter of the panel.

WOOD EDGED PANELS WILL NOT BE ACCEPTED.

- 2. CORE MATERIAL: Core Insulation will be high density expanded polystyrene. Core to have compressive strength ASTM D1621 - 25psi density with a nominal R-Value of 6.5. Core material must have a proven record for use in door fabrication without delaminating. Fill all openings, including frames.

POLYSTYRENE CORES ARE REQUIRED.

- 3. COLOR shall be selected from the full range of available manufacturer's options.
- 4. FIXED FRP PANEL: Panel will be two sheets of .120 fiberglass sheets bonded to 3/4" core material. Panel thickness shall be 1".

3.0 EXECUTION and INSTALLATION

- A. SIZES AND PROFILES: the sizes for door and frame units and profile requirements as listed or shown in these Specifications are approximate. All bidders are responsible for visiting job site and measuring each tag for bidding purposes.
- B. EXACT ORDER SIZES: ALL PROPER MEASURING AND ORDERING OF MATERIALS IS THE SOLE RESPONSIBILITY OF THE SUPPLIER/INSTALLER.

SECTION 08100 – FRP FIBERGLASS DOORS

- C. TOLERANCES between doors and frames are 1/8" around all sizes of single doors and 1/8" on hinge jambs and header with 3/16" in center of pairs, 1/4" at threshold.
- D. NOTIFY OWNER at least 48 hours before schedule date of installation for each opening and for each day of work.
- E. PROVIDE barrier protection and warning signs around each opening before starting to work. This protection is for the people who may be using the building while the work is in progress.
- F. COMPLY with all life safety code procedures that effect the use of the opening while work is being done. These procedures will be provided by an official of the building being worked on.
- G. SET NEW THRESHOLDS in a bed of cement and press to a level line. However, never let threshold be raised more than an extra 1/2" on any one side.
- H. PERIMETER CAULK new door frame on both sides of frame and with a matching color caulk to the finish of the frame.
- I. INSTALLERS ARE TO CLEAN up every day leaving area in a safe and usable condition.

END OF SECTION 08100

SECTION 08105- STEEL FRAMES

1.1 GENERAL

- A. Submit Product Data for each type of frame specified.
- B. Quality Assurance: Comply with ANSI/SDI 100.
- C. Fire-Rated Door Assemblies: NFPA 80, identical to assemblies tested per ASTM E 152, and labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - 1. Amweld Building Products, Inc.
 - 2. Benchmark Commercial Doors.
 - 3. Ceco Door Products.
 - 4. Copco Door Co.
 - 5. Curries Co.
 - 6. Deansteel Manufacturing Co.
 - 7. Fenestra Corp.
 - 8. Kewanee Corp.
 - 9. Mesker Door, Inc.
 - 10. Pioneer Industries.
 - 11. Republic Builders Products.
 - 12. Steelcraft.
 - 13. Or approved equal.
- B. Cold-Rolled Steel Sheets: ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality.
- C. Galvanized Steel Sheets: ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, with A 60 or G 60 (Z 180 or ZF 180) coating designation, mill phosphatized.
- D. Frames: Provide frames for doors, sidelights, borrowed lights, and other openings that comply with ANSI/SDI 100; fabricate to be rigid, neat in appearance, and free from defects, warp, or buckle.
 - 1. For interior frames provide units with mitered or coped and continuously welded corners, formed from 16 gage thick cold-rolled steel.
 - 2. For exterior frames provide units with mitered or coped and continuously welded corners, formed from 16 gage thick galvanized steel sheet.
 - 3. Door Silencers: 3 on strike jambs of single-door frames and 2 on heads of double-door frames.
 - 4. Plaster Guards: Provide where mortar might obstruct hardware operation and to close off interior of openings.
 - 5. For new frame install in existing opening. Knock down frame is allowed to secure to existing opening.

SECTION 08105- STEEL FRAMES

- E. Tolerances: Comply with SDI 117.
- F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to SDI 107 and the hardware specification.
- G. Finishes, General: Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
 - 1. Apply primers to frames after fabrication.
- H. Galvanized Steel Sheet Finishes: Comply with SDI 112 and the following:
 - 1. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780.
 - 2. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight.
 - 3. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - a. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.
 - 4. Field Painted Finish: Immediately after cleaning and pretreating, apply 2-coat finish consisting of prime coat and finish coat. See Section 09900, "Painting."
 - a. Color and Gloss: Match Architect's sample.
- I. Steel Sheet Finishes: Comply with SSPC-PA 1, "Paint Application Specification No. 1."
 - 1. Surface Preparation: Solvent-clean surfaces according to SSPC-SP 1. Remove mill scale and rust to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
 - 2. Pretreatment: Immediately after surface preparation, apply a conversion coating suited to organic coating applied over it.
 - 3. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

1.3 EXECUTION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

SECTION 08105- STEEL FRAMES

- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 2. Install at least 3 anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
 3. In-place gypsum board partitions, install knock-down, slip-on, drywall frames.
 4. Install fire-rated frames according to NFPA 80.
 5. Coordinate installation of all required wiring/conduit prior to frame installation.
- C. Door Installation: Fit new wood doors accurately in new hollow-metal frames, within clearances specified in ANSI/SDI 100, including new door in existing frame.
1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
- D. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- E. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Labeling of the Existing Frames: The frames may be indicated on the drawings to remain and be repaired so that they may meet the label standard for the indicated fire rating per NFPA80. The work is to include the repair of existing hollow metal frames, fill holes in frames by installing steel plugs of the same gauge and thickness as the metal frame, provide new filler plates, secure frame to sub-frame, repair door surface, fill holes, replace hardware, replace glazing and glazing frame, fit existing door in frame, provide intumescent seal and all notes as shown on the drawings. The Contractor shall prime and repaint the entire frame to match the existing frames or the Owner's color selection. It is the Contractor's responsibility to repair / modify the doors and frames to obtain the fire rating. When the work is completed, the Contractor shall contact one of the following testing labs or approved equal, for field inspections, required documentation and required door/frame labels. All associated costs to certify and label modified doors/frames shall be paid for by the Contractor.
1. Guardian Fire Testing Laboratories, Inc., Wenonah Terrace, Tonawanda, NY 14150, Telephone (716) 835-6880, Facsimile (716) 835-5682
 2. Intertek Testing Services, NA, Inc., Antioch Industrial Park, 2200 Wymore Way, Antioch, CA 94509, Telephone (925) 756-6606, Facsimile (925) 756-6094
 3. Or approved equal.

END OF SECTION 08105

SECTION 08211 - FLUSH WOOD DOORS

1.1 GENERAL

- A. Submittals: In addition to product data, submit the following:
1. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
 2. Samples of actual materials in small sections for each face material and finish.
- B. Quality Standard: Comply with the following standard:
1. NWWDA Quality Standard: I.S.1-A, "Architectural Wood Flush Doors," of the National Wood Window and Door Association.
 2. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute.
- C. Fire-Rated Wood Doors: Provide wood doors labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction. Provide certification for fire rating required acceptable to authorized agencies having jurisdiction for oversize fire rated doors over 4'-0" wide
- D. Warranty
1. Provide manufacturer's warranty to the following term:
 - a. Interior Solid Core Doors: "Full Life of Original Installation" including rehang and refinish if door(s) do not comply with Warranty tolerance standards.

1.2 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide doors by one of the following or approved equal:
1. Marshfield Door Systems, Inc., quality as defined in this section.
 2. Algoma Wood Doors Inc., quality as defined in this section.
 3. Eggers Wood Doors Inc., quality as defined in this section.
 4. Mohawk Wood Doors Inc., quality as defined in this section.
 5. V-T Industries Inc., quality as defined in this section.
 6. Buell Door Company, quality as defined in this section.
 7. Or approved equal.
- B. Interior Solid Core Doors for Transparent Finish: As follows:
NOTE: ALL WOOD VENEER MUST APPEAR UNIFORM AND LIGHT IN APPEARANCE
1. Faces: Select White Birch, plain sliced.
 2. Grade: "A" Select White ONLY

SECTION 08211 - FLUSH WOOD DOORS

3. Construction: 5 plies.
 4. Core: Structural composite lumber (engineered composite core)
 5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- C. Interior Fire-Rated Solid Core Doors: As follows:
1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
 2. Edge Construction: Provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance.
 3. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.
 4. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
- D. Pairs and Sets: Provide pair matching and set matching.
- E. Fabricate flush wood doors to comply with following requirements:
1. In sizes indicated for job-site fitting.
 2. Factory fit doors to comply with clearance requirements of referenced quality standard. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 3. Factory machine doors for hardware that is not surface applied.
 - a. Metal Removable Mullions: Pre-machine locks and formed-steel edges for hardware for pairs of doors requiring removable mullions. See the Hardware Schedule.
 4. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - a. Light Openings: Trim openings with moldings of material and profile indicated. * To be selected from manufacturer's standard profiles and colors unless noted otherwise. At existing buildings, metal trim shall be required to match adjacent existing to remain.
 - b. Louvers: Factory install louvers in prepared openings.
 5. Provide metal flashing at top of out swinging units.
- F. Finish wood doors at factory as factory finished.
1. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
 - a. Grade: Custom.
 - b. Finish: Manufacturer's standard finish with performance requirements comparable to either AWI System TR-2 catalyzed lacquer or AWI System TR-4 conversion varnish.

SECTION 08211 - FLUSH WOOD DOORS

- c. Staining: Match Architect's sample or existing buildings' wood doors.
 - d. Effect: Filled finish.
 - e. Sheen: Semigloss.
- G. Provide soundproof seal as noted in the Hardware Schedule. Adjust Hardware and frame to align properly to have the best acoustical effect.

1.3 EXECUTION

A. Examination

- 1. Verify substrate-openings conditions.
- 2. Verify that opening sizes and tolerances are acceptable and ready to receive this work.
- 3. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

B. Installation

- 1. Install fire-rated and non-rated doors in accordance with NFPA 80, manufacturers' instructions and fire rated labeling requirements.
- 2. Trim non-rated door width by cutting equally on both jamb edges.
- 3. Trim door height by cutting bottom edges to a maximum 3/4 inch (19mm).
- 4. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
- 5. Pilot drill screw and bolt holes using templates provided by hardware manufacturer. (Use threaded through bolts for half surface hinges.)
- 6. Coordinate installation of doors with installation of frames and hardware.
- 7. Coordinate installation of glass and glazing.
- 8. Install door louvers and light kits plumb and level.
- 9. Reseal or refinish any doors that required site alteration.

C. Warranty Tolerances

- 1. Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

D. Adjusting

- 1. Adjust work under provisions Division 1.
- 2. Adjust doors for smooth and balanced door movement.

E. Door and Frame Components Schedules

- 1. Refer to door and frame schedule.

END OF SECTION 08211

SECTION 08330 – ROLLING COUNTER FIRE SHUTTERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Manual automatic closing rolling counter fire shutter.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Provide shutter with Underwriters' Laboratories, Inc. label for the fire rating classification, 1 hr.

1.3 SUBMITTALS

- A. Reference Section 01300 Submittal Procedures; submit the following items:
 - 1. Product Data
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2015 registration
 - b. Provide proof of manufacturer and installer qualifications - see 1.4 below
 - c. Provide manufacturer's installation instructions
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual
 - b. Certificate stating that installed materials comply with this specification

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years' experience in producing counter fire doors and smoke control units of the type specified
 - 2. Installer Qualifications: Provide a letter from the Manufacturers approving the installer.
- B. Assembly Requirements:
 - 1. Fire-Rated Shutter Assemblies: complying with NFPA 80, identical to assemblies tested per UL 10b (or NFPA 252), and labeled and listed for fire ratings indicated by UL, FM, ITS, or another testing and inspecting agency acceptable to

SECTION 08330 – ROLLING COUNTER FIRE SHUTTERS

authorities having jurisdiction for 1 Hour Label Fire Rating (unless noted otherwise on the drawings).

2. Smoke Control: The air leakage rate of the fire shutter assembly shall not exceed 3.0 cubic feet per minute per square foot (0.01524 m³/s × m²) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests (Per IBC 2018-NJ Edition section 716.2.2.1.1).
3. Connect to building fire alarm system OR Provide fusible link operation.

1.5 DELIVERY STORAGE AND HANDLING

- A. Follow manufacturer's instructions

1.6 WARRANTY

- A. Standard Warranty: Provide two years from date of substantial completion against defects in material and workmanship

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer:
 1. Cornell
 - a. Model: ERC10 or approved equal with brush seals.
 2. Cookson
 3. Clopay Building Products
 4. or approved equal per Specification Section 01300

2.2 MATERIALS

- A. Curtain:
 1. Slat Configuration:
 - a. Galvanized Steel with Finish as Described Below: No. 1F, interlocked flat-faced slats, 1-1/2 inches (38 mm) high by 1/2 inch deep, minimum 22 gauge ASTM A 653, Commercial Quality, galvanized steel with plain steel bottom bar and vinyl astragal
 2. Finish:
 - a. GalvaNex™ or approved equal Coating System (Stock Colors):
 - 1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and white baked-on polyester enamel finish coat or equal factory baked-on finish.
 - 2) Field painting is not acceptable.

SECTION 08330 – ROLLING COUNTER FIRE SHUTTERS

B. Endlocks:

1. Fabricate continuous interlocking slat sections with high strength galvanized steel endlocks riveted to slats per UL requirements

C. Guides:

1. Configuration & Finish:

- a. Steel: minimum 12 gauge formed shapes
 - 1) Powder Coat (Stock Colors): Zirconium treatment followed by a white baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness or equal factory baked-on finish.
 - 2) Field painting is not acceptable.

D. Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width
2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. (110 N). Provide wheel for applying and adjusting spring torque.

E. Brackets:

1. Fabricate from reinforced steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
 - a. Finish:
 - 1) Powder Coat (Stock Colors): Zirconium treatment followed by a white baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness or equal factory baked-on finish.
 - 2) Field painting is not acceptable.

F. Hood and Mechanism Covers:

1. 24-gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
 - a. Finish:
 - 1) GalvaNex™ or approved equal Coating System (Stock Colors):
 - 2) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and white baked-on polyester finish coat or equal factory baked-on finish.
 - 3) Field painting is not acceptable.

SECTION 08330 – ROLLING COUNTER FIRE SHUTTERS

G. Seals:

1. Bottom Bar: PVC astragal.
2. Guides and Head: Replaceable brush seals sealing against fascia side of curtain to prevent smoke.

2.3 OPERATION

A. FireGard™ Series or approved equal Manual Crank Operation: Thermally activated, manually operated system with planetary gear reduction and internal release mechanism.

1. Provide an internal brake mechanism to hold the door at any position during normal door operation
2. Thermally activate automatic closure by melting of a fusible link on both sides of the fire wall.
3. Control automatic closure speed with an internal, totally enclosed, variable rate centrifugal governor without the use of electrical pulsation, non-variable rate viscosity, oscillation type or other governing devices
4. Maintain automatic closure speed at an average of 12" (304mm) per second
5. Reset door system by reconnecting fusible links or by re-engaging a failsafe release device from floor level
6. Provide minimum #50 roller chain from operator output shaft to the door drive shaft
7. Install system only with manufacturer supplied or specified fasteners
8. Ensure that manual resetting of spring tension or mechanical components will not be required
9. Drop test and reset door system twice by all means of activation and comply fully with NFPA 80 Section 5.

2.4 ACCESSORIES

A. Locking:

1. None

B. Operator and Full Bracket Mechanism Cover:

24-gauge galvanized steel sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

C. Test Device: Floor level test device that connects to fuse link arrangement and allows fire door testing without requiring ladders or tools to reset fuse link connections above the coil area.

PART 3 EXECUTION

3.1 EXAMINATION

- #### A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings

SECTION 08330 – ROLLING COUNTER FIRE SHUTTERS

- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates
- C. Commencement of work by installer is acceptance of substrate

3.2 INSTALLATION

- A. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports
- B. Comply with NFPA 80 and follow manufacturer's installation instructions

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

3.4 FIELD QUALITY CONTROL

- A. Site Test: Test doors for normal operation and automatic closing. Coordinate with authorities having jurisdiction to witness test and sign Drop Test Form

3.5 CLEANING

- A. Clean surfaces
- B. Remove surplus materials and debris from the site

3.6 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative
- B. Instruct Owner's Representative in maintenance procedures

END OF SECTION

SECTION 08412 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Special Conditions and other Division 0 and Division 1 Project Manual Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. This Section Includes:
 - 1. Exterior and interior manual-swing entrance doors and door-frame units.
 - 2. Exterior & interior storefronts.

1.3 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.
- B. Structural Loads:
 - 1. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7-16 "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 2. Seismic Loads: IBC 2018, NJ Edition.

SECTION 08412 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

3. Design wind load velocity at the project site is 100 mph
 4. Importance factor is 1.15
 5. Exposure category is "C"
- C. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/240 + 1/4$ " at openings greater than 13'6" and shall not exceed $L/175$ at openings lesser than 13'6" of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits. The maximum wind load design pressure for this project is 35 psf.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (75 Pa).
- F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa). The storefront systems shall have a maximum no leakage water performance of 12 psf.
- G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 57 for the framing when tested according to AAMA 1503-98.
- I. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.55 Btu/sq. ft. x h x deg F (3.92 W/sq. m x K) when tested according to AAMA 1503-98.

SECTION 08412 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed storefront and door systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 - 2. Submit to architect approved shop drawings for Structural Stamp & Calculations provided by Professional Engineer registered in the state of New Jersey for all local jurisdiction codes and wind velocities indicated. Calculations shall indicate the adequacy of the storefront and curtain wall systems perimeter anchors & attachments and the structural integrity of the fenestration system framing members. The final shop drawings must be readable for field personnel to use as an installation guideline regarding fastener type and locations.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- F. Other Action Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Qualification Data: For qualified Installer.
- H. Welding certificates.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

SECTION 08412 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

- J. Source quality-control reports.
- K. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- L. Warranties: Submit a copy of the Manufacturer's Special Ten (10) year Warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative is to verify installation contractor's approval for ability to complete installation of units required for this Project.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects as judged solely by the architect, except with architect's approval. If revisions or substitutions are proposed, submit comprehensive explanatory data to architect within thirty (30) days of Notice to Proceed per Specification Section 01300, "Submittals". After thirty (30) days, no substitution products will be considered.
 - 2. No stock length materials will be allowed for this project. All materials are to be factory fabricated by the manufacturer at their facility in order to be utilized for this project
- C. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- D. Single-Source Responsibility: Provide windows, storefront, entrance doors, and related fenestration system sections, as well as all necessary accessories from one source and produced by a single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

SECTION 08412 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of metals, other materials, & metal finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - f. Noise or vibration caused by thermal movement
 - g. Water Leakage through fixed glazing and framing areas
- 2. Warranty Period: Ten (10) years from date of Substantial Completion.

- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

- 1. Warranty Period: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- A. Entrance Door Hardware:

- 1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
- 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EFCO Corporation
 2. YKK AP America, Inc.
 3. Wausau Window & Wall Systems.
 4. Oldcastle Building Envelope Systems.
 5. Or approved equal.
- B. Basis of Design Products: Subject to compliance with requirements, provide EFCO products; series 401, 402, & 403 storefronts and entrance packages inclusive of series D500 entrance doors OR YKK AP products; series YES 45 TU (for Exterior) and YES 45 FI (for Interior) storefronts and entrance packages inclusive of series 50D Wide Stile Doors. (Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.)

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: storefront systems are screw spline construction.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: As indicated on architectural drawings.
- B. Framing Members, General:
1. All storefront members shall have a minimum wall thickness of .080". The face dimension for the storefront system will be not less than 2" and the frame depth will not be less than 4 ½". All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design will be such that raw edges will not be visible at joints.
 2. EFCO Model D500 Entrance Doors and 401, 402 & 403 Storefront, or approved equal. No stocklength materials will be allowed for this project. All materials are to be factory fabricated by the manufacturer at their facility in order to be utilized for this project.

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3. Any manufacturer bidding this project with their storefront systems must provide their own internal steel reinforcement members as required to meet the project wind load design criteria and a maximum of 35 psf wind load design pressure.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Provide nonmagnetic stainless steel or ceramic coated fasteners warranted by the fenestration system installer to be non-corrosive and accessories compatible with adjacent materials.
 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.
- G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation. Basis of design is EFCO series D500 Wide Stile Doors or approved equal.
 1. Major portion of the door sections shall have a .125" (3 mm) wall thickness. Glazing stop sections shall have a .050" (1.2 mm) wall thickness.
 2. Door stiles shall be no less than 5" (127 mm) wide (not including glass stops). Door sill shall have 12" high section.
 3. Door stiles and rails shall have hairline joints at the corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be installed in one stile of pairs of doors and in jamb stiles of center pivoted doors.

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4. Doorstops shall include a bulb weather-strip that complies with ASTM E 2203 specification.
5. Glazing Stops and Gaskets: Manufacturer's standard compression types, replaceable, that maintain uniform pressure and watertight seal, snap-on, extruded-aluminum stops and preformed gaskets.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 1. At exterior doors, provide compression weather stripping at fixed stops.
 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

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- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High Performance Organic Finish: AA-C12C42R1X (Chemical Finish: Cleaned & inhibitive chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - 1. Fluoropolymer two coat system: Manufacturer's standard two-coat, thermocured system consisting of specifically formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70% polyvinylidene fluoride resin by weight; complying with AAMA 2605. Architect is to select a custom color (non-metallic / non-exotic), which the fenestration system manufacturer can match 'in house'. Architect will select the custom color during the shop drawing review process.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.

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4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

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3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
 - 1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Test Area: A minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems. Field Test to be in accordance with Test Method "A" under AAMA 501.2.
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.6 CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weather tight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.7 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08412

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

PART 1 - GENERAL

1.1 General Requirements

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and other Division-0 and Division-1 Project Manual Sections, apply to this Section.

1.2 Section Includes

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the aluminum projection windows as shown on the Drawings and/or specified herein, including but not limited to, the following:
 - 1. Aluminum project in, project out, and fixed combination window systems.
 - 2. Anchors, hardware and accessories including panning, interior trim pieces and subframe / receptors.

1.3 Definitions

- A. AW: Architectural Grade; thermal break and glazing.
- B. Performance grade number, included as part of the ANSI/AAMA product designation code is actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.
- C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.
- D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 Performance Requirements

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
 - 1. Minimum size required by ANSI/AAMA 101/1.5.2-97.
- B. ANSI/AAMA 101-97 Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with ANSI/AAMA 101-97.
 - 1. Performance Class: AW
 - 2. Performance Grade: Minimum for performance class indicated. (120)
 - 3. Testing performed according to ANSI/AAMA 101-97, Uniform Load Deflection Test ASTM E 330.
- C. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on IBC 2021 NJ Edition, ASCE 7-16 (minimum design loads for buildings and other structures), and passing ASTM

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E330, Uniform Load Structural Test, at basic wind speed indicated:

1. Design Criteria:
 - a. Exposure: 'C'
 - b. Importance factor: 1.15
 - c. Wind load: 124 mph
 - d. SHEG II $A/v=0.10$
 - e. SPC C $A/a=0.10$
 2. The wind load design pressures for this project are 42 psf @ non-corner zones and 52 psf @ corner zones.
- D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283, Air Infiltration Test.
1. Maximum Rate: 0.1 cfm/sq.ft. (2 cu. m/h x sq.m) of area at an inward test pressure of 6.24 lbf/sq.ft. (300 Pa).
- E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to ASTM E 331/ASTM E 547, Water Resistance Test.
1. Test Pressure: 15 static air pressure difference of 15.0 psf.
- F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503 or per NFRC 100 simulation data, showing a minimum CRF of 73 for the frame.
- G. Thermal Transmittance: At both the Base Bid & Alternate Bid, window manufacturer to provide aluminum windows with a whole-window U-value maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503 or per NFRC 100 simulation data.
1. U-Value: 0.47 Btu/sq.ft. X h x deg F (W/sq.m x K) for operable sash.
 2. U-Value: 0.37 Btu/sq.ft. X h x deg F (W/sq.m x K) for fixed frame.
- H. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient.
- I. Projected Windows: Comply with ANSI/AAMA 101-97 for the following tests:
1. Torsion Test.
 2. Horizontal Concentrated Load Test on Latch Rail.
 3. Vertical Concentrated Load Test on Latch Rail.
 4. Torsion Load Test on Intermediate Frame Rails.
 5. Vertical Concentrated Load Test on Intermediate Frame Rails.
 6. Balance Arm Load Test.

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

1.5 Submittals

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and the following:
 - 1. Mullion details, including reinforcement and stiffeners.
 - 2. Joinery details.
 - 3. Expansion provisions.
 - 4. Flashing and drainage details.
 - 5. Weather-stripping details.
 - 6. Thermal-break details.
 - 7. Glazing details.
 - 8. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:
 - a. Structural test pressures and design pressures from basic wind speeds indicated.
 - b. Deflection limitations of glass framing systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes. Architect reserves the right to choose from full color offerings for anodized finish. Color is to match Architects' sample.
- D. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below:
 - 1. Main Framing Member: 12-inch-(300-mm) long, full-size sections of extrusions with factory-applied color finish.
 - 2. Hardware: Full-size units with factory-applied finish.
 - 3. Weather Stripping: 12-inch-(300-mm) long sections.
 - 4. Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.
- E. Qualification Data: For installer and testing agency.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each operation and configuration of aluminum window. Test results based on use of down-sized AAMA standard test size units will not be accepted.
- G. Shop drawings shall be sealed by a state licensed structural engineer to assure all requirements in this specification and drawings are met. The final shop drawings must be readable for field personnel to use as an installation guideline regarding fastener type and fastener locations.
- H. Submit a copy of the Manufacturer's Special 10 year warranty.

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

1.6 Quality Assurance

- A. **Manufacturers Qualifications:** Must have minimum 10 years of continuous fabrication of aluminum windows similar in design and scope to that which is required for this project. The window products supplied for this project must be produced and glazed by the same factory assembly line that the certified test window unit was produced. Any products fabricated by independent subcontractor organizations using “S.L.” stock length parts at their own factory or shop facilities will not be accepted. Field glazing is not permitted.
- B. **Installer Qualifications:** An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. **Single Source Responsibility:** Provide aluminum window units, related fenestration system sections, and all necessary accessories from one source and produced by a single manufacturer.
- E. For maximum performance, windows for this project must meet both the testing requirements stated herein and the minimum material requirements specified. Windows which carry the applicable AAMA rating but which do not meet the material thickness and depths are not acceptable for use on this project.
- F. **Product Options:** Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section “Product Requirements”.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 - 2. Provide AAMA certified aluminum windows.
 - 3. Do not revise intended aesthetic effects as judged solely by the architect, except with architect’s approval. If revisions or substitutions are proposed, submit comprehensive explanatory data to architect within thirty (30) days of Notice to Proceed per Specification Section 01300, “Submittals”. After thirty (30) days, no substitution products will be considered.
- G. **Glazing Publications:** Comply with published recommendations of glass manufacturers and GANA’s “Glazing Manual” unless more stringent requirements are indicated.
- H. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section “Project Management and Coordination”. Review methods and procedures related to aluminum windows including, but not limited to, the following:
 - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

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2. Review and finalize construction schedule and verify availability of materials. Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.

1.7 Project Conditions

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 Warranty

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 1. Failure to meet performance requirements.
 2. Structural failures including excessive deflection.
 3. Water leakage, air infiltration, or condensation.
 4. Faulty operation of movable sash and hardware.
 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 6. Insulating glass failure.
- B. Warranty Period: ten (10) years for windows and insulated glass from date of Substantial Completion.
- C. Warranty Period for Metal Finishes: ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide architectural grade thermal project-in, project out, and fixed combination windows, with minimum 4-1/2" frame depth, by one of the following or approved equal:
 1. Fixed Windows (all aluminum not less than 0.125 inches thick):
 - a. EFCO Corporation: Series 450X.
 - b. Oldcastle Building Envelope / Moduline-Model: Signature 16PL series.
 - c. Wausau Window and Wall Systems: Model 4250I.
 - d. Architectural Window Manufacturing Corporation Series 3400i
 2. Projected Windows (all aluminum not less than 0.125 inches thick):
 - a. EFCO Corporation: Series 450X.
 - b. Oldcastle Building Envelope / Moduline-Model: Signature 16PL series.
 - c. Wausau Window and Wall Systems: Model 4250I.
 - d. Architectural Window Manufacturing Corporation Series 3400i

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- B. The following specifications are based on EFCO Corporation, Series 450X (Enhanced Thermal Performance Window).

2.2 Materials: General

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.125-inch (1.6-mm) thickness at any location for the main frame and sash members.
- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch (3.2-mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, non-corrosive, pressed-in, splined grommet nuts.
 - 2. Exposed Fasteners: Unless avoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member of hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.
- E. Replaceable Weather Seals: Comply with AAMA 701/702.
- F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 Glazing

- A. Glass: Exterior glass lite comprised of ¼" standard bronze or grey tint tempered and interior glass lite comprised of ¼" clear tempered with Vitro "SB60" soft coat Low E @ #3 surface complying with Division 8 Section "Glazing". The air spacer cavity shall be Argon gas filled.
- B. Glazing System: Manufacturer's standard "insulated glass" factory-glazing system that produces weather tight seal as indicated in Division 8 Section "Glazing".

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2.4 Hardware

- A. General: Provide manufacturer's standard hardware fabricated from, stainless steel, complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide white bronze alloy and nonmagnetic stainless steel.
- B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Projected Windows: Provide the following operating hardware:
 - 1. Hinge: 4 bar Anderberg Arm Hinge.
 - 2. Lock: Combination lever handle and cam-action lock with stainless steel operation arm. Operable sash at more than 6'0" off of finish floor should be provided with pole operated cam action locks. Each classroom with a pole operated sash should receive (1) one pole @ 6'0" length with wall mount clip.
 - 3. Limit Device: Concealed limit shim device; located on jamb of each ventilator. School District to provide Architect with final allowable clear opening dimensions.

2.5 Insect Screens

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window and provide for each operable exterior sash or ventilator.
 - 1. Aluminum Tubular (extruded) Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows", Architectural C-24, or Monumental M-32 class.
 - 2. Comply with SMA 1004, "Specifications for Aluminum (extruded) Tubular Frame Screens for Windows", for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, adjustable rollers, and removable PVC spline/anchor concealing edge of frame.
 - 1. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch (1-mm) wall thickness.
 - 2. Finish: Match aluminum window frame finish.
- C. Aluminum Mesh Fabric: 18-by-16 (0.11 diameter) mesh of PVC-coated, alum mesh threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration in the following color. Comply with ASTM D 3656.
 - 1. Mesh Color: **Silver Gray**.

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

- D. Wickets: Provide full hinge sash wickets or fixed mount screens, if required framed and trimmed for a tight fit and durability during handling.

2.6 Fabrication

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with ANSI/AAMA 101-97 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.
- B. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed ANSI/AAMA 101-97 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
 - 1. Projected Windows: AW120.
- C. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- D. Thermally Improved Construction: All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 - 1. The thermal barrier shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. Poured and debridged urethane thermal barriers shall not be permitted.
- E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- F. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- G. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
- H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units to meet project wind loads. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Vertical side stacking between window units is permitted provided window system provides necessary structural values to meet project specific wind loads.
- I. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch (1.6-mm) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

- J. Exterior Panning: Provide exterior extruded panning system as indicated on architectural drawings as shown, of profile and dimensions indicated but not less than 0.062-inch thick extruded aluminum. Finish to match window units. Corners of the panning shall be factory mitered. Panning assembly shall not require the use of exposed fasteners. Panning shall be shipped KD and field assembled. A stainless steel corner alignment clip shall be provided for each joint. Clip shall be of such a design that after panning is installed, weather sealing or caulking will completely cover the clip. Back seal all panning frame joints to prevent water migration into frame cavity prior to installation.
- K. Interior Trim: Provide interior trim as indicated on architectural drawings as shown, of profile and dimensions indicated but not less than 0.050-inch thick extruded aluminum. Finish to match window units.
- L. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section “Glazing” and with ANSI/AAMA 101-88.

2.7 Finishes

- A. General: Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Finish: Fluorocarbon 2 coat thermocured system, composed of specifically formulated inhibitive primer and fluorocarbon color topcoat containing not less than 70% PVFD resin by weight; comply with AAMA 2605. The color selected by Owner/Architect to be a custom color (non-metallic / non-exotic), which the window manufacturer can match. The architect will select the custom color during the shop drawing review process.

PART 3 - EXECUTION

3.1 Examination

- A. Examine openings, substrates, structural support, anchorage, and conditions with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76-mm) of opening.

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offset at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101-I.S.2.

3.3 Field Quality Control

A. Testing Services; Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A, B, by applying same test pressures required to determine compliance with AAMA/NWWDA 101/I.S.2 in Part 1 "Performance Requirements" Article.

2. Testing Extent: Three (3) windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.

3. Test Reports; Shall be prepared according to AAMA 502.

B. Remove and replace windows where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 Adjusting

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

3.5 Protection and Cleaning

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains or other contaminants immediately according to manufacturer's written recommendations.
- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.6 Demonstration

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system. Refer to Division 1 Section "Closeout Procedures".

END OF SECTION 08520

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bullet resistant interior security pass-thru transaction window, fixed window and teller window units.
 - 2. Bullet resistant glazing.

1.2 REFERENCES

- A. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
- B. Underwriters Laboratory:
 - 1. UL 752 - Ballistic Standards:
 - a. Level I MPSA 9mm.
 - b. Level III SPSA .44 Magnum.

1.3 PERFORMANCE REQUIREMENTS

- A. System Design:
 - 1. Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with IBC 2015, New Jersey Edition.
- B. Ballistics-Resistance Performance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
 - 1. Listed and labeled as bullet resisting according to UL 752.
 - 2. Tested for ballistics resistance according to UL 752.
- C. Forced-Entry-Resistance Performance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
 - 1. Tested for forced-entry resistance according to ASTM F588.

1.4 SUBMITTALS

- A. Section 01300 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate configuration, sizes, rough-in, mounting, construction and glazing details as well as installation clearances and finishes.

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

- C. Product Data:
 - 1. Submit manufacturer's product data for specified Products indicating materials, operation characteristics, and finishes.
- D. Samples:
 - 1. Provided 4" x 4" glazing sample if requested by Owner/Architect.
- E. Test Reports:
 - 1. Provide test reports to indicate compliance with specified bullet resistance performance on the drawings. (Level 1 or Level 3 glass)
- F. Manufacturer's Installation Instructions:
 - 1. Submit installation instructions with requirements to accommodate specific site conditions.
- G. Provide manufacturer qualifications to confirm the company specializes in manufacturing products specified in this section with minimum 10 years documented experience.
 - 1. Provide evidence that the manufacturer participates in a Quality Assurance Validation Program.
- H. Provide installer qualifications to confirm the company specializes in installation of window systems specified with minimum three (3) years documented experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Follow the manufacturer's requirements for transporting, handling, storing, and protecting products.
- B. Ordering: To avoid construction delays comply with ordering instructions and lead time requirements as set by window system manufacturer.
- C. Pack window units in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.
- D. Store window units and accessories on raised blocks to prevent moisture damage. Protect from exposure to weather and vandalism.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

1.7 COORDINATION

- A. Coordinate work with adjacent materials specified in other Sections and as indicated on Drawings and approved shop drawings.
- B. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in [concrete] [or] [masonry]. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Furnish manufacturer's standard two-year warranty from the date of substantial completion in which manufacturer agrees to repair or replace windows, drawers and any components that fail in materials or workmanship within specified warranty period. This warranty is in addition to, and not a limitation of other rights Owner has under the contract.
 - 1. Warranty Period:
 - a. Two (2) year parts and labor from date of substantial completion
 - 2. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - b. Structural failures including deflections exceeding 1/4 inch.
 - c. Failure of welds.
 - d. Excessive air leakage.
 - e. Faulty operation of sliding window hardware.
 - f. Faulty operation of transaction drawers.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars:
 - 1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
- B. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- C. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.
- D. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

2.2 WINDOW COMPONENTS

- A. Comply with requirements of UL listing for ballistics-resistance levels as specified.
- B. Glazing: Basis of Design is “LEXGARD”. (or approved equal)
 - 1. Provide as noted on the Drawings either Level I M PSA 9 mm or Level 3 Bullet Resistant Glazing:
 - a. U.L. Level 1, MP 750, 3/4 inch thick, 4.76 lbs./SF; 9 mm bullet resistant
 - b. U.L. Level 3, SP 1250, 1 1/4 inch thick, 7.97 lbs./SF; 44 Mag. bullet resistant
- C. Track/Slides: Stainless steel ball bearing slides all windows and drawers.
- D. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers, and with a proven record of compatibility with surfaces contacted in installation:
 - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
 - 2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
 - 3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, of sufficient strength to withstand design pressure indicated.

2.3 BULLET RESISTANT EXTERIOR AND INTERIOR SECURITY WINDOW UNITS

- A. Manufacturers Basis of Design is: (Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.)
 - 1. Quikserv Corp.
 - a. Model QS-NJ-LW1 (Single Horizontal Sliding Window Unit):
 - 1) Service Opening: See Window Schedule
 - 2) Rough Opening: Verify in Field
 - 3) Glazing:
 - a) Refer to 2.2 WINDOWS, B.1
 - 4) Finish: Stainless Steel
 - 5) Handing: Verify with Owner
 - b. Model QS-NJ-LW2
 - 1) Service Opening: See Window Schedule
 - 2) Rough Opening: Verify in Field
 - 3) Glazing:
 - a) Refer to 2.2 WINDOWS, B.1

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

- 4) Finish: Stainless Steel
- 2. Or approved equal

2.4 DEAL TRAYS AND SHELVES

- A. Refer to Window Schedule Details

2.5 INTERCOM AND TALK THROUGH

- A. Manufacturers – Quikserv Inc: (or approved equal)
 - a. Model: 6 inch Round Heavy Stainless Steel Level 3 Speak-Thru.

2.6 SECURITY DEVICE ACCESSORIES

- A. Provide a security lock bar.
- B. Auto-Lock Handle: Stainless steel constructed auto-locking handle on all self-closing sliders to prevent intrusion.

2.7 FABRICATION

- A. Fabricate window to dimensions indicated on Drawings.
- B. Fabricate windows, and accessories to provide a complete system for assembly of components and anchorage of window, drawers and accessories.
 - 1. Provide units that are reglazable from the secure side without dismantling the nonsecure side of framing.
 - 2. Prepare security windows for glazing unless preglazing at the factory is indicated.
- C. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
 - 1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.
- D. Prepare components with reinforcement required for hardware.
- E. Welding: To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- G. Factory-cut openings in glazing for speaking apertures.

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

- H. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated.
- I. Weather Stripping: Factory applied.
- J. Bottom Sills: Stainless steel construction, no bottom tracks and no pop rivets.
- K. Handles: Stainless steel, manufacturer's standard profile and finish.

2.8 SHOP FINISHING

- A. Stainless Steel: 304 Stainless Steel with NAAMM No. 3 finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of existing conditions before starting work
- B. Verify construction is ready to receive Products specified in this section.
- C. Verify rough openings are correct size and in correct location.
- D. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- E. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- F. For glazing materials whose orientation is critical for performance, verify installation orientation.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Furnish frames and anchors to other sections as required for installation in surrounding partition and casework construction.

3.3 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Align Products plumb, level and square.

SECTION 08565 – SECURITY TRANSACTION AND FIXED BULLET RESISTANT WINDOWS

- C. Rigidly secure Products to adjacent supporting construction.
- D. Glaze windows in accordance with manufacturer’s instructions.
- E. Seal perimeter joints.

3.4 ADJUSTING

- A. Section 01700 - Execution and Closeout Requirements {01700 - Execution Requirements}: Requirements for adjusting.
- B. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.
- C. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and [weathertight and] secure enclosure.
- D. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

- A. Section 01700 – Contract Closeout: Requirements for cleaning.
- B. Remove protective material from factory finished surfaces.
- C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.
- E. Clean metal and glass surfaces to polished condition.
 - 1. Lubricate sliding security window hardware.
 - 2. Lubricate transaction drawer hardware.
- F. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

SECTION 08710 - DOOR HARDWARE

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.

SECTION 08710 - DOOR HARDWARE

- 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
 2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
- E. Inspection and Testing:
1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Fire door assemblies, in compliance with NFPA 80.
 - b. Required egress door assemblies, in compliance with NFPA 101.

SECTION 08710 - DOOR HARDWARE

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
 - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

SECTION 08710 - DOOR HARDWARE

4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
1. Keying Conference
 - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.
 2. Pre-installation Conference
 - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Inspect and discuss preparatory work performed by other trades.
 - c. Inspect and discuss electrical roughing-in for electrified door hardware.
 - d. Review sequence of operation for each type of electrified door hardware.
 - e. Review required testing, inspecting, and certifying procedures.
 - f. Review questions or concerns related to proper installation and adjustment of door hardware.
 3. Electrified Hardware Coordination Conference:
 - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

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- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - a) Schlage L Series: 10 years
 - b) Or approved equal
 - 2) Exit Devices
 - a) Von Duprin: 10 years
 - b) Or approved equal
 - 3) Closers
 - a) LCN 4000 Series: 30 years
 - b) Or approved equal
 - b. Electrical Warranty
 - 1) Exit Devices
 - a) Von Duprin: 3 years
 - b) Or approved equal

SECTION 08710 - DOOR HARDWARE

1.08 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01300.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fabrication
 - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

SECTION 08710 - DOOR HARDWARE

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex (or approved equal) connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Select
 - b. Hager
 - c. ABH
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.04 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin EPT-10
 - b. Or approved equal

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2. Acceptable Manufacturers and Products:
 - a. ABH PT1000
 - b. Security Door Controls PTM
 - c. or Approved Equal by Architect

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.05 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Burns
 - b. DCI
 - c. Trimco
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.06 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco
 - c. DCI
 - d. Don-Jo
 - e. or Approved Equal by Architect

SECTION 08710 - DOOR HARDWARE

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage L9000 series
 - b. Or approved equal
2. Acceptable Manufacturers and Products:
 - a. Accurate 9000/9100 series
 - b. Best 45H series
 - c. or Approved Equal by Architect

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-3/5-inch x 3/5 inch with 180-degree visibility. Provide messages color-coded using ANSI Z535 Safety Red with full text and/or symbols, as scheduled, for easy visibility. When applicable allows for lock status indication on both sides of the door.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
 - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
 - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
 - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.

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- d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
 - e. Connections – provide quick-connect Molex or approved equal system standard.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
- a. Lever Design: 06A

2.08 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin 98 series
 - b. Or approved equal
2. Acceptable Manufacturers and Products:
 - a. Detex Advantex series
 - b. Precision APEX 2000 series
 - c. or Approved Equal by Architect

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.

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15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.09 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage/Von Duprin PS900 Series
 - b. Or approved equal
2. Acceptable Manufacturers and Products:
 - a. Precision ELR series
 - b. Dynalock 5000 series
 - c. Security Door Controls 600 series
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
 - a. 12/24 VDC Output, field selectable.
 - b. Class 2 Rated power limited output.
 - c. Universal 120-240 VAC input.
 - d. Low voltage DC, regulated and filtered.
 - e. Polarized connector for distribution boards.
 - f. Fused primary input.
 - g. AC input and DC output monitoring circuit w/LED indicators.
 - h. Cover mounted AC Input indication.
 - i. Tested and certified to meet UL294.
 - j. NEMA 1 enclosure.
 - k. Hinged cover w/lock down screws.
 - l. High voltage protective cover.

2.10 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer:
 - a. Best
 - b. Or approved equal

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2. Acceptable Manufacturers and Products:
 - a. Match owners existing key system
- B. Requirements:
 1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
 2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
 - a. Open: cylinder with small format interchangeable core (SFIC) core with open keyway

2.11 KEYING

- A. Scheduled System:
 1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:
 1. Construction Keying:
 - a. Replaceable Construction Cores.
 - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a) 3 construction control keys
 - b) 12 construction change (day) keys.
 - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
 2. Permanent Keying:
 - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - 1) Master Keying system as directed by the Owner.
 - b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 - c. Provide keys with the following features:
 - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
 - 3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
 - d. Identification:
 - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
 - 2) Identification stamping provisions must be approved by the Architect and Owner.

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- 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
- 1) Permanent Control Keys: 3.
 - 2) Master Keys: 6.
 - 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
 - 4) Key Blanks: Quantity as determined in the keying meeting.

2.12 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Telkee
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. HPC
 - b. Lund
 - c. or Approved Equal by Architect

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. LCN 4040XP series
 - b. Or approved equal
2. Acceptable Manufacturers and Products:
 - a. Corbin-Russwin DC8000 series
 - b. Sargent 281 series
 - c. or Approved Equal by Architect

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B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Closers shall be capable of being upgraded by adding modular mechanical or electronic components in the field.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Elmes
 - b. Burns
 - c. Trimco
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

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2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco
 - c. or Approved Equal by Architect

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Size plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
 - a. Glynn-Johnson
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. Rixson
 - b. Sargent
 - c. ABH
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal

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2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco
 - c. or Approved Equal by Architect

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Zero International
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. National Guard
 - b. Reese
 - c. DHSI
 - d. Legacy
 - e. or Approved Equal by Architect

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.19 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
 - b. Or approved equal

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2. Acceptable Manufacturers:
 - a. Burns
 - b. Rockwood
 - c. Trimco
 - d. or Approved Equal by Architect

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Schlage
 - b. Or approved equal
2. Acceptable Manufacturers:
 - a. GE-Interlogix
 - b. or Approved Equal by Architect

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.

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2. Replace construction cores with permanent cores as indicated in keying section.
 3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
1. Conduit, junction boxes and wire pulls.
 2. Connections to and from power supplies to electrified hardware.
 3. Connections to fire/smoke alarm system and smoke evacuation system.
 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 5. Connections to panel interface modules, controllers, and gateways.
 6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
- M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

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1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets: Please note that the Hardware Schedule has basis of design manufacturers listed. Approved equal manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

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Abbreviation	Name
BES	Best Locking Systems
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
TBD	Manufacturer To Be Determined
VON	Von Duprin
ZER	Zero International Inc

122346 OPT0396280 Version 2

Legend:

⚡ Electrified Opening

Hardware Group No. 01

For use on Door #(s):

406	407	408	409	410	411
412	413	416	417	418	419

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	OFFICE/ENTRY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9050BD 06A 09-544 OS-LOC IS-LOC	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER
1	EA	FINGER GUARD	951A 36" (914MM)	A	ZER

** CLASSROOMS

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 01.1

For use on Door #(s):

318B

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	OFFICE/ENTRY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9050BD 06A 09-544 OS-LOC IS- LOC	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER
2	EA	THRESHOLD	268A-NH	A	ZER
2	EA	THRESHOLD	269A-NH	A	ZER
1	EA	THRESHOLD	674A-NH	A	ZER
2	EA	THRESHOLD	675A-NH	A	ZER

Hardware Group No. 01.2

For use on Door #(s):

402 403 404 415

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	OFFICE/ENTRY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9050BD 06A 09-544 OS-LOC IS- LOC	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 02

For use on Door #(s):

406A	407A	408A	409A	410A	411A
412A	413A	415A	416A	417A	418A
419A					

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	FINGER GUARD	951A 36" (914MM)	A	ZER
3	EA	SILENCER	SR64	GRY	IVE

** CLASSROOM TOILETS

Hardware Group No. 02.1

For use on Door #(s):

402A

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9040 06A 09-544 OS-OCC IS- LOC	626	SCH
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 03

For use on Door #(s):

307

Provide each PR door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	COORDINATOR X FILLER	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER
2	EA	THRESHOLD	268A-NH	A	ZER
2	EA	THRESHOLD	269A-NH	A	ZER
1	EA	THRESHOLD	674A-NH	A	ZER
2	EA	THRESHOLD	675A-NH	A	ZER

Hardware Group No. 03.1

For use on Door #(s):

318A

Provide each PR door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
2	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	COORDINATOR X FILLER	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER
1	EA	THRESHOLD	548A-NH	A	ZER

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 03.2

For use on Door #(s):

415B

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	CONCEALED OVERHEAD STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	312A-S	A	ZER

Hardware Group No. 03.3

For use on Door #(s):

414

414A

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	SET	GASKETING	312A-S	A	ZER

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 03.4

For use on Door #(s):

414B

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 04 - SGL, NFR, ISW, CONT, OFF, WS

For use on Door #(s):

405

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	OFFICE/ENTRY LOCK	L9050BD 06A 09-544	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	WALL STOP	WS406/407CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 05

For use on Door #(s):

312

Provide each SGL door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	98-NL-OP-110MD	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
1	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
1	EA	RECESSED DOOR PULL	PROVIDED BY FRP DOOR MFG.		TBD
1	EA	CONCEALED OVERHEAD STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ WMS	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	312A-S	A	ZER
1	EA	DOOR SWEEP	8197AA	AA	ZER
2	EA	THRESHOLD	268A-NH	A	ZER
2	EA	THRESHOLD	269A-NH	A	ZER
1	EA	THRESHOLD	673A-NH	A	ZER
1	EA	THRESHOLD	674A-NH	A	ZER
1	EA	THRESHOLD	675A-NH	A	ZER

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 06

For use on Door #(s):

400 401C 401B

Provide each PR door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	CONTINUOUS HINGE W/ EPT	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	✎ 689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	98-NL-OP-110MD	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-110MD-CON 24 VDC	✎ 626	VON
1	EA	SFIC MORTISE CYLINDER	80-102	626	SCH
2	EA	SFIC RIM HOUSING	80-129	626	SCH
3	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
3	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
2	EA	RECESSED DOOR PULL	PROVIDED BY FRP DOOR MFG.		TBD
2	EA	SPRING CUSH SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	312A-S	A	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	SADDLE THRESHOLD	65A	A	ZER
1	EA	WIRE HARNESS TO POWER SUPPLY	CON-192P		VON
1	EA	LOCK TO HINGE CONNECTOR	CON-32		VON
2	EA	DOOR CONTACT	679-05HM	✎ BLK	SCE
1	EA	POWER SUPPLY	PS904 120/240 VAC	✎	VON
1	EA	WIRING DIAGRAMS, CARD READERS, BY DIV	BY SECURITY INTEGRATOR	✎ TBD	TBD

16

OPERATIONS:

DOOR NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT LOCK.

REQUEST TO EXIT SWITCH / SENSOR SHUNTS DOOR FORCED OPEN IN ACCESS CONTROL SYSTEM.

KEY OVER-RIDE WILL CAUSE DOOR FORCED ALARM IN ACCESS CONTROL SYSTEM

FREE EGRESS AT ALL TIMES

SECTION 08710 - DOOR HARDWARE

Hardware Group No. 06.1

For use on Door #(s):

401A

Provide each PR door(s) with the following:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CONTINUOUS HINGE	224HD	628	IVE
1	EA	CONTINUOUS HINGE W/ EPT	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	✎ 689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	98-NL-OP-110MD	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-110MD-CON 24 VDC	✎ 626	VON
1	EA	SFIC MORTISE CYLINDER	80-102	626	SCH
2	EA	SFIC RIM HOUSING	80-129	626	SCH
3	EA	SFIC CONSTRUCTION CORE	SFIC 7 PIN CORE	626	BES
3	EA	SFIC PERMANENT CORE	SFIC 7 PIN CORE	626	BES
2	EA	RECESSED DOOR PULL	PROVIDED BY FRP DOOR MFG.		TBD
2	EA	SPRING CUSH SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	312A-S	A	ZER
1	EA	H/C SADDLE THRESHOLD	545A-223	A	ZER
1	EA	WIRE HARNESS TO POWER SUPPLY	CON-192P		VON
1	EA	LOCK TO HINGE CONNECTOR	CON-32		VON
2	EA	DOOR CONTACT	679-05HM	✎ BLK	SCE
1	EA	POWER SUPPLY	PS904 120/240 VAC	✎	VON
1	EA	WIRING DIAGRAMS, CARD READERS, BY DIV 16	BY SECURITY INTEGRATOR	✎ TBD	TBD

OPERATIONS:

DOOR NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT LOCK.

REQUEST TO EXIT SWITCH / SENSOR SHUNTS DOOR FORCED OPEN IN ACCESS CONTROL SYSTEM.

KEY OVER-RIDE WILL CAUSE DOOR FORCED ALARM IN ACCESS CONTROL SYSTEM

FREE EGRESS AT ALL TIMES

END OF SECTION

SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows
 - 2. Doors.
 - 3. Store Front.

1.2 DEFINITIONS

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

SECTION 08800 – GLAZING

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in 130 miles per hour at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1) Seismic Loads: IBC 2021, NJ Edition.
 - 2) Design wind load velocity at the project site is 125 mph
 - 3) Importance factor is 1.15
 - 4) Exposure category is "C"
 - b. Specified Design Snow Loads: 30 PSF, but not less than snow loads applicable to Project as required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7.0, "Snow Loads." Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - c. Minimum Glass Thickness for Exterior Lites: Not less than 1/4".
 - d. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick of thickness indicated.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 1/4", 6.0 mm thick and a nominal 1/2-inch-12.7-mm-) wide interspace.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

SECTION 08800 – GLAZING

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.
- C. Glazing Schedule: Use same designations indicated on Drawings.
- D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

1.5 QUALITY ASSURANCE

- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
- B. Glazing for Fire-Rated Door Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257 and 16 CFR 1201.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and IBC 2018 NJ Edition.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA/GANA Publications: “Glazing Manual” and "Laminated Glazing Reference Manual.”
 - 2. FGIA/IGMA Publication for Insulating Glass: IGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups as shown on Drawings for one bay or curtain wall or one unit window.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

SECTION 08800 – GLAZING

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass, Laminated Glass and Insulating Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 GLASS PRODUCTS

A. Tinted Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Guardian Glass, LLC; See Schedule or select comparable product by one of the following:

- Vitro.
- Interpane.
- Or approved equal.

B. Fully Tempered Float Glass; ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion horizontally oriented upon completion of installation, unless otherwise indicated.

C. Low-E Coated Vision Glass: ASTM C 1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified.

D. Laminated Glass: comply with ASTM C 1172. Provide products classified by the Glass Industry for use in "Safety Glazing Applications". Laminated Glass shall comply with the Consumer Product Safety Commission 16 CFR 1201 and the Safety Glass requirements of ANSI Z97.1 (current editions). Complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide FT (fully tempered) float glass.

SECTION 08800 – GLAZING

2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal.
4. Spacer Specifications: Manufacturer's standard spacer material and construction.
5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Stainless Steel warm edge spacer OR Aluminum with mill or clear anodic finish.
 - b. Corner Construction: Manufacturer's standard corner construction.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those

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referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral-Curing Silicone Glazing Sealants:

a. Products:

- 1) See Section 07920 - Joint Sealants.
- 2) Type and Grade: S (single component) and NS (nonsag).
- 3) Class: 100/50.
- 4) Use Related to Exposure: NT (nontraffic).
- 5) Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

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- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.8 LAMINATED GLASS UNITS (Interior Glazing Only)

- A. Laminated Glass – (Laminated 5/16” Units):
 - 1. Products:
 - a. PPG Industries
 - b. Interpane Glass Company
 - c. Guardian Industries Corp.
 - d. Or approved equal
 - 2. Class 1 (clear) 5/16” laminated glass with laminate film sandwiched between two panes of glass.
 - a. 1/8” clear tempered glass - .060 PVB - 1/8” clear tempered glass (laminated sandwich panel).

2.8 INSULATING GLASS UNITS

- A. Low-E Coated, Tinted Insulating **Vision** Glass Unit IG-1 Gray/Light Gray (Standard 1” Unit):
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Outdoor Lite: 1/4 inch (6 mm), Class 2 (tinted), float glass.
 - a. Tint Color: Owner to select from manufacturer’s standard light gray, gray and/or blue tint colors.
 - b. Low-E Coating on #2 Surface: Guardian SunGuard SN 68 or approved equal.
 - c. Heat Treatment: Kind FT (fully tempered).
 - 3. Interspace: Argon filled, 1/2 inch wide, hermetically sealed.
 - 4. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - a. Heat Treatment: Kind FT (fully tempered).
 - 5. Glass Unit Performance Values for **Light Gray (CrystalGray) Glass**:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.29.

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6. Glass Unit Performance Values for **Gray Glass**:
 - a. Visible Light Transmittance: 34 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.24.

- B. Low-E Coated, Clear Insulating **Vision** Glass Unit IG-1 Blue Glass (Standard 1” Unit):
 1. Overall Unit Thickness: 1 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 1 (clear) float glass.
 - a. Low-E Coating on #2 surface: Guardian SunGuard SNE 50/25 or approved equal.
 - b. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 1/2 inch wide, hermetically sealed.
 4. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - a. Heat Treatment: Kind FT (fully tempered).
 5. Glass Unit Performance Values for **Blue Glass**:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Winter Nighttime U-Factor: 0.24 maximum.
 - c. Summer Daytime U-Factor: 0.21 maximum.
 - d. Solar Heat Gain Coefficient: 0.25.

- C. Ceramic or Silicone Coated, Low-E Coated, Tinted Insulating **Spandrel** Glass Unit IG-1S Gray/Light Gray (Standard 1” Unit):
 1. Overall Unit Thickness: 1 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 2 (tinted), float glass.
 - a. Tint Color: Owner to select from manufacturer’s standard light gray, gray and/or blue tint colors.
 - b. Low-E Coating on #2 Surface: Guardian SunGuard SN 68 or approved equal.
 - c. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 1/2 inch wide, hermetically sealed.
 4. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - a. Coating on #4 Surface: Gray Silicone or Ceramic Spandrel.
 - b. Heat Treatment: Kind FT (fully tempered).
 5. Glass Unit Performance Values for **Light Gray (CrystalGray) Glass**:
 - a. Visible Light Transmittance: 0 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.23.
 6. Glass Unit Performance Values for **Gray Glass**:
 - a. Visible Light Transmittance: 0 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.19.

- D. Ceramic or Silicone Coated, Low-E Coated, Clear Insulating **Spandrel** Glass Unit IG-1S Blue Glass (Standard 1” Unit):
 1. Overall Unit Thickness: 1 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 1 (clear) float glass.

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- a. Low-E Coating on #2 surface: Guardian SunGuard SNE 50/25 or approved equal.
 - b. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 1/2 inch wide, hermetically sealed. (
 4. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - a. Coating on #4 Surface: Gray Silicone or Ceramic Spandrel.
 - b. Heat Treatment: Kind FT (fully tempered).
 5. Glass Unit Performance Values for **Blue Glass**:
 - a. Visible Light Transmittance: 0 percent minimum.
 - b. Winter Nighttime U-Factor: 0.24 maximum.
 - c. Summer Daytime U-Factor: 0.21 maximum.
 - d. Solar Heat Gain Coefficient: 0.19.
- E. Low-E Coated, Tinted Insulating **Translucent (Acid Etched)** Glass Unit IG-1T Gray/Light Gray (Standard 1” Unit):
1. Overall Unit Thickness: 1 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 2 (tinted), float glass.
 - a. Tint Color: Owner to select from manufacturer’s standard light gray, gray and/or blue tint colors.
 - b. Low-E Coating on #2 Surface: Guardian SunGuard SN 68 or approved equal.
 - c. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 1/2 inch wide, hermetically sealed.
 4. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - a. Coating on #3 Surface: Opaque Opacity Acid Etched Glass.
 - b. Heat Treatment: Kind FT (fully tempered).
 7. Glass Unit Performance Values for **Light Gray (CrystalGray) Glass**:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.29.
 8. Glass Unit Performance Values for **Gray Glass**:
 - a. Visible Light Transmittance: 34 percent minimum.
 - b. Winter Nighttime U-Factor: 0.25 maximum.
 - c. Summer Daytime U-Factor: 0.22 maximum.
 - d. Solar Heat Gain Coefficient: 0.24.
- F. Low-E Coated, Clear Insulating **Translucent (Acid Etched)** Glass Unit IG-1T Blue Glass (Standard 1” Unit):
3. Overall Unit Thickness: 1 inch.
 4. Outdoor Lite: 1/4 inch (6 mm), Class 1 (clear) float glass.
 - a. Low-E Coating on #2 surface: Guardian SunGuard SNE 50/25 or approved equal.
 - b. Heat Treatment: Kind FT (fully tempered).
 5. Interspace: Argon filled, 1/2 inch wide, hermetically sealed.
 6. Indoor Lite: 1/4 inch (6 mm), Class 1 (clear), float glass.
 - c. Coating on #3 Surface: Opaque Opacity Acid Etched Glass.
 - d. Heat Treatment: Kind FT (fully tempered).

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6. Glass Unit Performance Values for **Blue Glass**:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Winter Nighttime U-Factor: 0.24 maximum.
 - c. Summer Daytime U-Factor: 0.21 maximum.
 - d. Solar Heat Gain Coefficient: 0.25.

2.9 INSULATING LAMINATED GLASS UNITS

- A. Low-E Coated, Tinted, Laminated Insulating-Glass Unit IG-2 Gray/Light Gray (Security/Laminated Units):
 1. Overall Unit Thickness: 1 and 1/16 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 2 (tinted) float glass.
 - a. Tint Color: Owner to select from manufacturer's standard light gray, gray and/or blue tint colors.
 - b. Low-E Coating on #2 Surface: Guardian SunGuard SN 68 or approved equal.
 - c. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 3/8 inch wide, hermetically sealed.
 4. Indoor Laminated Glass Unit: Class 1 (clear) float glass, 7/16" laminated glass.
 - a. Laminated Sandwich: 3/16 inch (5 mm) clear glass - 0.060" PVB interlayer - 3/16 inch (5 mm) clear glass.
 - b. Heat treatment: Kind FT (fully tempered).
- B. Low-E Coated, Clear, Laminated Insulating-Glass Unit IG-2 Blue Glass (Security/Laminated Units):
 1. Overall Unit Thickness: 1 and 1/16 inch.
 2. Outdoor Lite: 1/4 inch (6 mm), Class 1 (clear) float glass.
 - a. Low-E Coating on #2 Surface: Guardian SunGuard SNE 50/25 or approved equal.
 - b. Heat Treatment: Kind FT (fully tempered).
 3. Interspace: Argon filled, 3/8 inch wide, hermetically sealed.
 4. Indoor Laminated Glass Unit: Class 1 (clear) float glass, 7/16" laminated glass.
 - c. Laminated Sandwich: 3/16 inch (5 mm) clear glass - 0.060" PVB interlayer - 3/16 inch (5 mm) clear glass.
 - d. Heat treatment: Kind FT (fully tempered).

PART 3 - EXECUTION

3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

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2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
 4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
 2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 3. Apply heel bead of elastomeric sealant.
 4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 5. Apply cap bead of elastomeric sealant over exposed edge of tape.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
 2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 3. Install gaskets so they protrude past face of glazing stops.
- D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until

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sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08800

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

1.1 GENERAL

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Where fire resistance rated gypsum board assemblies are indicated, provide gypsum board assemblies that are identical to assemblies tested for fire resistant according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Design framing systems in accordance with 2021 IBC New Jersey Edition and AISI S220.

1.2 SUBMITTALS

- A. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria for inspection agencies.
- B. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA) or similar organization providing a verifiable code-compliance program.
- C. Provide an index (table of contents) of job specific products, assemblies and reference the contract drawing details. Indicate on the manufacturer's cut sheets the specific products, gauge, etc. to be used (be specific).

1.3 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - 1. Steel Framing and Furring:
 - a. ClarkDietrich
 - b. Marino/Ware (formerly Marino Industries Corp.).
 - c. Or approved equal.
 - 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. USG Interiors, Inc.
 - c. Or approved equal.
 - 3. Gypsum Board and Related Products:
 - a. GP Gypsum, LLC
 - b. National Gypsum Co.; Gold Bond Building Products Division (NG).
 - c. United States Gypsum Co. (USG).
 - d. Or approval equal.

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- B. Steel Framing Components for Suspended and Furred Ceilings: Provide components complying with ASTM C 754 for conditions indicated.
1. Powder-Actuated Fasteners in Concrete: Corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190.
 2. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.
 3. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.
 4. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive coating.
 5. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive coating.
 6. Channels: Cold-rolled steel, 16 ga minimum thickness of base steel and 1/2- inch- (13-mm-) wide flanges, and as follows:
 - a. Carrying Channels: 2 inches (50.8 mm) deep, 590 lb/1000 feet (88 kg/100 m), unless otherwise indicated.
 - b. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.
- C. Steel Studs for Furring Channels: AISI S220, in depth indicated and with 0.0179 inch (0.45 mm) minimum base steel thickness, unless otherwise indicated.
1. Protective Coating: Comply with AISI S220; ASTM A 653, G 40 (Z120); or coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120) hot-dip galvanized coating for framing for exterior soffits and ceiling suspension members in areas within 10 feet (3 m) of exterior walls. Galvannealed products are unacceptable.
 - a. Coating to demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.
- D. Steel Resilient Furring Channels: Standard product fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) to form ½-inch- (12.7-mm-) deep channel of the following configuration unless otherwise indicated:
1. Double-Leg Configuration: Hat-shaped channel with 1-1/2-inch- (38.1-mm-) wide face connected to flanges by double-slotted or expanded-metal legs (webs).
 2. Single-Leg Configuration: Asymmetrical.
 - a. Product: ClarkDietrich; RC Deluxe (RCSD) Resilient Channel or approved equal.
- E. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung system.
- F. Steel Framing for Walls and Partitions: Provide a minimum of 20 gauge interior non-bearing steel framing members complying with the following requirements: (for all bearing walls refer to structural drawings)

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

1. Protective Coating: Comply with AISI S220; ASTM A 653, G 40 (Z120) or coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120), hot-dip galvanized coating for framing members attached to and within 10 feet (3 m) of exterior walls. Galvannealed products are unacceptable.
 - a. Coating to demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.
2. Steel Studs and Runners: AISI S220 in depth indicated 20 gauge minimum base steel thickness, unless otherwise indicated.
 - a. Product: ClarkDietrich; ProSTUD Drywall Framing System ProSTUD 30 (0.0296 inch – 0.7518 mm) for typical walls and ProSTUD 33 (0.0329 inch – 0.8382 mm) for tile walls with Smart Edge technology and with DiamondPlus® Coating or approved equal.

INTERIOR NON-BEARING GYPSUM STUD PARTITION HEIGHT LIMITATION & GAUGE TABLE

INTERIOR NON-BEARING GYPSUM STUD PARTITION			
1 5/8" STUD 16" o.c.	2 1/2" STUD 16" o.c.	3 5/8" STUD 16" o.c.	6" STUD 16" o.c.
X	18 GA. UP TO 12'- 6"	18 GA. UP TO 16'- 6"	16 GA. UP TO 22'- 0"
20 GA, UP TO 8'- 10"	20 GA. UP TO 11'- 6"	20 GA. UP TO 15'- 0"	X
SEE STRUCTURAL DRAWINGS FOR OTHER FRAMING GAUGE & SIZE			

- G. Steel Rigid Furring Channels: AISI S220, hat shaped, in depth indicated and with 0.0296 inch (20 gauge), minimum base steel thickness unless otherwise indicated.
 1. Product: ClarkDietrich; Furring Channel or approved equal.
- H. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

- I. Gypsum Board Products: Types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Abuse Resistant Gypsum Board: Hi-Abuse Brand Wallboard, fire resistant gypsum core encased in a heavy, smooth, white abrasion resistant paper on the face side and heavy liner paper on the back side, 5/8" thick. Conforming to the physical properties of ASTM C36 and ASTM C1177 on Glass mat back. Rating of 10 "No Mold Growth" as tested for 4 weeks according to ASTM D3273 "Armor Plus" manufactured by Georgia-Pacific Corporation or approved equal.
 2. Moisture Rated Gypsum Board: (Interior Moisture, Mold and Mildew Resistant Gypsum Wallboard): Coated inorganic glass mat-faced, water resistant treated gypsum core wallboard, 5/8" thick. Conforming to the physical properties of ASTM 630 and ASTM C1177, Rating of 10 "No Mold Growth" as tested for 4 weeks according to ASTM D3273. DensArmor Plus Interior Guard manufactured by Georgia-Pacific Corporation or approved equal.
 3. Tile Backer: (Water Resistant Board):
 - a. DensShield Tile Backer (or approved equal) sheathing conforming to ASTM C 1178/C, mold resistant; 5/8" thick, non-combustible; perm rating <1.5.
 - b. Cementitious Backer Units: ANSI A 118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges. Product subject to compliance with requirements of USG Corporation; DUROCK cement board, 5/8" thick; mold resistance ASTM D 3273, score of 10, or approved equal.
 4. Exterior Sheathing: DensGlass Gold Exterior (or approved equal) sheathing conforming to ASTM C1177, water-resistant, treated core with a fiberglass mat face and back, 5/8" thick, non-combustible; resistant to growth of mold per ASTM D3273.
- J. Gypsum Board Base Layer(s) for Multilayer Applications: ASTM C 1396 in thickness indicated:
1. Type: 5/8 inches Type X where required for fire-resistance-rated assemblies.
 2. Type: Sag-resistant type for ceiling surfaces, unless otherwise indicated.
- K. Accessories for Interior Installations: Cornerbead, edge trim, and control joints complying with ASTM C 1047, formed metal or plastic, with metal complying with the following requirement:
1. Steel sheet zinc added space coated by hot dip proceed or rolled zinc.
- L. Joint Treatment Materials: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
1. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

- a. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
 - 1) Product: ClarkDietrich; Strait-Flex Butt-Tape, or approved equal.
2. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 - a. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
 - b. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 - c. For topping compound, use sandable formulation.
3. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 - a. Ready-Mixed Formulation: Factory-mixed product.
 - 1) Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - 2) All-purpose compound formulated for both taping and topping compounds.
- M. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that is effective in reducing the airborne transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
- N. Miscellaneous Materials: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
 1. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.
 2. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
 3. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
 4. Steel drill screws complying with ASTM C 1002 for the following applications:
 - a. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
 - b. Fastening gypsum board to gypsum board.
 5. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

6. Foam Gaskets: Closed-cell vinyl foam adhesive-backed strips, that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit metal stud size indicated.
7. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation to comply with ASTM C 665 for Type I.

1.4 EXECUTION

- A. Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
 1. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
 2. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - a. Where building structure abuts ceiling perimeter or penetrates ceiling.
 - b. Where partition framing and wall furring abut structure, except at floor.
 3. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.
- B. Installing Steel Framing for Suspended and Furred Ceilings: as follows:
 1. Sway-brace suspended steel framing with hangers used for support.
 2. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
 3. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- C. Installing Steel Framing for Walls and Partitions: Install steel studs and furring at spacings indicated.
 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
 2. Extend partition framing full height to structural supports or substrates above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 3. Cut studs 1 inch short of full height to provide perimeter relief.
 4. All interior walls are STC-rated and some are fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
 5. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated.

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

6. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
- D. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
1. Install sound-attenuation blankets prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
 2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 3. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
 4. Form control and expansion joints, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels. Provide per manufacturer's recommendations / industry standards.
 5. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
 6. All walls are STC-rated gypsum board assemblies. Seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
 7. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - a. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications or as required by fire resistive design.
 8. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.
 9. Install water resistant gypsum board within 6 feet of wet locaitons. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.
 10. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
 - a. Fasten with screws.
 11. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:
 - a. Fasten both base layers and face layers separately to supports with screws.
- E. Installing Trim Accessories: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

1. Install cornerbead at external corners.
 2. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 - a. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - b. Install L-bead where edge trim can only be installed after gypsum panels are installed.
 - c. Install U-bead where indicated.
 - d. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.
- F. Finishing Gypsum Board Assemblies: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
1. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
 2. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
 3. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214-15.
 - a. For all areas provide Level 4 finish for gypsum board surfaces.
 4. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
 5. Finish water-resistant gypsum backing board to comply with ASTM C 840 and gypsum board manufacturer's directions.

END OF SECTION 09255

SECTION 09300 – CERAMIC TILE

1.1 General

- A. ANSI Tile Standards: Comply with ANSI A137.1 Standard Specification for Ceramic Tile and ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile."
- B. TCNA Installation Guidelines: The current edition of the TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation"; comply with TCNA installation method F112 for recessed wet set floor construction, W223 and W202I for interior wall construction.
- C. Submittals: With manufacturer's product data and installation instructions for tile work, submit samples of each type, color, and texture of tile mounted on 12-inch-square backing with joints grouted.
- D. Attic Stock: Provide 5 percent of amount installed, packaged with protective covering for storage, and identified with labels clearly describing contents, before installation begins. Furnish attic stock: Furnish not less than 1 box for each 50 boxes or a fraction thereof, of each type, color, pattern, and size as installed.

1.2 Products

- A. Colors, Textures, and Patterns: For tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, comply with the following requirements:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
 - 2. The Architect may use multiple color patterns.
- B. Sizes and Thicknesses: 4 1/4" x 4 1/4" x 5/16" thick for wall tiles. 2" x 2" x 1/4" thick for all floor tiles.
- C. Tile Grade: Provide category one and two standard grade color selection samples for field use and up to category four color selection samples for accent tiles. When the Contract Documents call to match existing tile, the Contractor shall include "color match" by QTCO distributed by Daltile or approved equal.
- D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- E. Unglazed Ceramic Mosaic Floor Tile: Factory-mounted flat tile and as follows:
 - 1. Composition: Porcelain with abrasive admixture.
 - 2. Face: Standard design with cushion edges.
- F. Glazed Wall Tile: Factory-mounted flat tile and as follows:

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1. Face: Plain with cushion edge.
 2. Mounting: Back-mounted.
- G. Backer Board: Provide ¼" thick cement backer board at all existing CMU wall surfaces to receive new ceramic tile finish. Backer boards shall be fabricated with 90% Portland cement and sand mixture to resist damage from moisture. Formulation and structure must provide strength, uniform composition and excellent tile adhesion. Provide HardieBacker by James Hardie or approved equal.
- H. Quarry tile: 6" x 6" x ¾" with abrasive grain used in kitchen area. Plain face including 6" wall base in kitchen area.
- I. Trim Shapes: Same material, size, color, and texture as field tile. Provide cove base, inside and outside vertical coves and beads.
- J. Marble Thresholds: Group "A"; ASTM C 503, for exterior use with minimum hardness of 10.0 per ASTM C 241; white with honed finish unless otherwise indicated.
- K. Surface Preparation Materials: Provide surface preparation materials as follows:
1. Trowelable Floor/Wall Patch and Render Mortar: Quick-Setting, Polymer-Modified, Fiber-Reinforced, Cementitious Rendering, Patching, and Leveling Mortar, can be applied at 1/8 inch to 1-1/4 inch (3 mm to 32 mm).
 - a. Product: MAPEI, Planitop 330 Fast.
 - b. Or approved equal
 2. Trowelable Concrete Floor Patch: High-Performance, Fast-Setting Cementitious Patching Compound. Can be applied at 1/16 inch to 1-1/2 inches (1.5 mm to 38 mm) neat and from 1-1/2 inches to 3 inches (38 mm to 76 mm) neat in areas no larger than 24 sq ft (2.23 sq m).
 - a. Product: MAPEI, Mapecem Quickpatch.
 - b. Or approved equal
- L. Self-Leveling Underlayments: Provide self-leveling underlayments as follows:
1. Quick-Setting, Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement. Applied Minimum Uniform Thickness: 1/8 to 1 inch (3 to 25 mm).
 - a. Product: MAPEI, Novoplan 2 Plus.
 - 1) Primer required: MAPEI, Primer T.
 - 2) or approved equal
- M. Waterproof and Crack Isolation Membranes: Provide Waterproof and Crack Isolation membranes as follows:
1. Fluid-Applied Membrane: Advanced liquid-rubber; extremely quick-drying, premium waterproofing and crack- isolation membrane, IAPMO-listed, ANSI

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A118.10 and A118.12.

- a. Product: MAPEI, Mapelastic AquaDefense. (or approved equal)
 - 1) With MAPEI, Reinforcing Fabric (or approved equal)

N. Setting Materials: Provide setting materials as follows:

- 1. Portland Cement Mortar: Materials complying with ANSI A 108.1 and as follows:
 - a. Latex additive (water emulsion) as follows, replacing part or all of gauging water, specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.
 - 1) Latex Additive: Manufacturer's standard.
 - a) Product: MAPEI, Planicrete AC.
 - b) Or approved equal
- 2. Dry-Set Portland Cement Mortar: ANSI A118.1.
- 3. Latex-Portland Cement Mortar: ANSI A118.4.
 - a. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site.
 - 1) Dry Polymer Additive: Manufacturer's standard.
 - a) Product: MAPEI, Ultraflex 2 or Keraflex Plus.
 - b) Or approved equal
- 4. Improved Modified Dry-Set Cement Mortar: Non-Sag, for Large and Heavy Tile; ANSI A118.4HTE, ANSI A118.11, ANSI A118.15HTE, and ISO 13007 C2TES1P1.
 - a. Product: MAPEI Ultraflex LFT or Keraflex Super.
 - b. Or approved equal
- 5. Improved Modified Dry-Set Cement Mortar: ANSI A118.4E, ANSI A118.11, ANSI A118.15E, and ISO 13007 C2ES2P2.
 - a. Product: MAPEI, Kerabond/Keralastic System or Ultralite S2.
 - b. or approved equal
- 6. Latex additive as described below, replacing part or all of gauging water, combined at job site with prepackaged dry mortar mix specified by latex additive manufacturer.
 - a. Latex Type: Manufacturer's standard.
 - 1) Product: MAPEI, Kerabond/Keralastic System.
 - 2) Or approved equal

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7. Organic Tile Adhesive: ANSI A136.1, Type I.
- O. Grouting Materials: Provide grouting materials as follows:
1. Latex-Portland Cement Grout: ANSI A118.6 of the following composition.
 - a. Latex additive (water emulsion) replacing part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:
 - 1) Latex Type: Manufacturer's standard.
 - 2) Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.
 2. High Performance Cement Tile Grout: For grout joints from 1/16 to 3/4 inch (1.5 to 19 mm) and meeting ANSI A118.7 and ISO 13007 CGWAF.
 - a. Product: MAPEI; Ultracolor Plus FA.
 - b. Or approved equal
 3. Commercial Industrial Grade Water-Cleanable Epoxy Grout: For grout joints from 1/8 to 5/8 inch (3 to 16 mm), ANSI A118.3 and ISO 13007 RG.
 - a. Product: MAPEI, Kerapoxy IEG CQ. Or approved equal
 - b. Provide product with a VOC content of 65000 ppm (65 grams per L) or less when calculated according to 40 CFR 59, Subpart D.
 - c. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F (60 degrees C) and 212 degrees F (100 degrees C), respectively, and certified by manufacturer for intended use.
- P. Elastomeric Sealants: Manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Joint Sealers" including ASTM C 920 as referenced by Type, Grade, Class, and Uses.
1. One-Part Mildew-Resistant Silicone Sealants: ASTM C 920, Type S, Grade NS, Class 25, Uses NT, G, A, and O (for use in joints in nontraffic areas).
 - a. Product: MAPEI; Mapesil T Plus.
 - b. Or approved equal
- Q. Miscellaneous Materials: Provide the following materials:
1. Metal Edge Strips: Stainless steel or zinc alloy, 1/8-inch wide at top edge.
 2. Temporary Protective Coating: As follows, formulated to protect exposed surfaces of tile against adherence of mortar and grout, compatible with tile and mortar/grout products, and easily removable without damaging grout or tile.
 - a. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at

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least 0.5 percent oil, with a melting point of 120 deg F (49 deg C) to 140 deg F (60 deg C) per ASTM D 87.

3. Sulfamic Acid Crystals: Cleaner and problem-solver for nonporous, acid-resistant tile and natural stone. Removes cured cement grout haze, mortar residue, rust stains and mineral deposits such as efflorescence.
 - a. Product: MAPEI, UltraCare Sulfamic Acid Crystals.
 - b. Or approved equal
4. Grout release: high-performance sacrificial coating that protects the tile surface from grout stains, improves cleanability and reduces the risk of grout haze or film residue, interior and exterior applications on all-natural stone; marble, limestone, sandstone, slate, granite and travertine, porcelain/ceramic tiles, masonry and quarry tiles.
 - a. Product: MAPEI, UltraCare Grout Release.
 - b. Or approved equal
5. Solvent-Based Penetrating Sealer: Natural-look providing maximum protection against most common stains. For use on interior and exterior natural stone; marble, limestone, sandstone, slate, granite, travertine, unglazed porcelain and ceramic tiles, masonry, quarry tiles and cement grout. Can also be used as a pre-grouting sealer.
 - a. Product: MAPEI, UltraCare Penetrating SB Stone, Tile and Grout Sealer.
 - b. Or approved equal
6. Neutral pH Cleaner: Highly concentrated, zero-VOC, for ceramic, porcelain and natural stone surfaces and prevent soap scum buildup and hard water deposits.
 - a. Product: MAPEI, UltraCare Concentrated Tile and Grout Cleaner.
 - b. Or approved equal
7. High-Alkaline Cleaner: Highly concentrated and degreaser that quickly removes waxes, grease, oil, light soap scum, mildew and algae stains. For areas that have been neglected or subject to heavy use.
 - a. Product: MAPEI, UltraCare Heavy-Duty Stone, Tile and Grout Cleaner.
 - b. Or approved equal

1.3 Execution

- A. Field-Applied Temporary Protective Coating: Where indicated under or needed to prevent adhesion or staining of exposed tile surfaces by grout, precoat tile with a continuous film of temporary protective coating indicated below:
 1. Petroleum paraffin wax.

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- B. Installation: Follow TCNA Installation Guidelines. TCNA "Handbook for Ceramic Tile Installation"; comply with TCNA installation method F112-2007, F113-2007 for recessed wet set floor construction, W202-2007, W223-2007 for wall construction.
- C. Existing Floor Preparation: Assume that major floor preparation and leveling will be required on concrete subfloor. Provide positive slope to the floor drain. Assume that up to 1 ½" of leveling may be required on existing concrete subfloor.
- D. Joint Pattern: Use grid pattern with 1/16-inch-wide joints unless otherwise indicated.
- E. Expansion, Control, Contraction, and Isolation Joints: As indicated per TCNA Method EJ171.
 - 1. Seal tile joints with elastomeric sealants to comply with Division 7 Section "Joint Sealers."
- F. Edge Strips: Provide at exposed edge of tile meeting carpet, wood, or resilient flooring, unless otherwise indicated.
- G. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 - 3. Remove temporary protective coating, by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
 - 4. Floor drain: Slope setting mortar bed to floor drain for positive water flow. Remove and clean the drain cover after grouting and final cleaning.

END OF SECTION 09300

SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 Summary:

- A. This Section includes acoustical ceilings consisting of suspended exposed-grid systems with lay-in acoustical panels.

1.2 Submittals:

- A. Product Data: Manufacturer's complete technical descriptive literature for each item required, including specifications and installation recommendations.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Within 60 days after award of Contract, submit coordination drawings for all new or altered areas, drawn accurately to a scale no less than 1/8" = 1' - 0", coordinating penetrations and ceiling-mounted items. Coordinate with other prime contractors to obtain necessary information and agreement on location of penetrations and ceiling-mounted items. Upon review and acceptance by Architect, incorporate revisions (if any) into an AutoCAD -based file. Furnish one hard copy of accepted shop drawings and one updated CAD-file copy to all other applicable prime contractors for their further information and use. Show the following:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - 3. Bulkheads, soffits, areas with drywall ceilings (if any), and areas of exposed structure (if any).
 - 4. Room names and numbers, ceiling types, and ceiling elevations above the finished floor.
 - 5. Special moldings at walls, column penetrations, and other junctures with adjoining construction, including all curved walls and bulkheads.
 - 6. Ceiling-mounted items, including light fixtures; HVAC air distribution devices; speakers; fire alarms; sprinkler heads; and other similar devices or fixtures.
- C. Shop Drawings: Show details and information pertinent to construction, installation, and placement of all components required for continuous, smooth wall angles at curved walls, bulkheads and circular columns. Include sections of typical curved wall angle.

1.3 Quality Assurance:

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical tile ceilings and finishes similar in material, design, and extent to that indicated for this Project and with a minimum five-year record of successful in-service performance.
- B. Source Limitations for Ceiling Units: Obtain all acoustical panel and grid systems from one single source.

1.4 Delivery, Storage and Handling:

- A. Deliver acoustical materials and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be

SECTION 09510 - ACOUSTICAL CEILINGS

protected against damage from moisture, direct sunlight, surface contamination, and other detrimental conditions.

- B. Before installing acoustical materials, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles and panels carefully to avoid chipping edges or damaging units in any way.

1.5 Project Conditions:

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. The work area shall be broom clean and the structure in proper condition to receive acoustical materials. Acoustical work shall follow the installation of ductwork, piping and conduit located in ceiling space above ceilings.

1.6 Coordination:

- A. Coordinate layout and installation of acoustical materials and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 Extra Stock:

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units:
 - a. ACT Type A: One extra carton of full-size units of each type.

PART 2 PRODUCTS

2.1 Acoustical Ceilings. General:

- A. Humidity Resistance: Unless indicated otherwise, ceiling panels shall be rated for 90% humidity conditions and shall have a 10-year sag- and warp-resistance warranty, comparable to Armstrong's "HumiGuard Plus" or approved equal.
- B. Acoustical Ceiling Colors: Manufacturer's standard white, unless indicated otherwise.
- C. Fire-Test-Response Characteristics: Provide ceilings (ceiling panels/tiles, grids and accessories) that comply with the following requirements:
 - 1. Fire-response tests were performed by UU, ITS/Wamock Hersey, or another

SECTION 09510 - ACOUSTICAL CEILINGS

independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.

2. Surface-burning characteristics of acoustical panels shall comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

- D. Dimensions: Length by width dimensions for lay-in ceiling panels are nominal dimensions. Actual dimensions are to be factory-cut sizes that fit within suspended ceiling grids having standard modular dimensions matching the specified panel nominal length and width.

2.2 Acoustical Ceiling Systems:

- A. ACT-A: 24 in. x 48 in. x 7/8 in. lay-in panels with square edge profile; wet-formed panel composed of mineral fiber with a factory-applied, vinyl latex paint finish; minimum light reflectance (LR) rating of 0.84; minimum ceiling attenuation class (CAC) of 40; and minimum noise reduction coefficient (NRC) of 0.70. Suspension system - Type A.

1. Subject to compliance with requirements, provide one of the following panel products:
 - a. Armstrong World Industries; School Zone Fine Fissured #1714
 - b. Certaineed; Sereno Fine Fissured #SFF-497 HNRC/HCAC
 - c. USG Interiors; Radar Clima Plus, High-NRC #2410
 - d. or approved equal

2.3 Suspension Systems:

- A. General: Unless indicated otherwise, suspension grids shall comply with ASTM C 635 "Intermediate Duty" Classification.

- B. Suspension System Types:

1. Type A: Exposed grid system with 15/16 in. wide face, shall be HDG steel, Class A Fire Rated, White.

- C. Suspension System Accessories: Provide all accessories necessary to complete installation, including, but not limited to, the following:

1. Preformed, factory-finished, bull-nosed comers to match grid material and finish. Provide comers where grid meets bull-nosed block.
2. Provide impact clips at toilet room and gymnasium ceilings.
3. Provide retention clips for ceilings located in wind locks and vestibules.
4. Provide white, dual durometer polyvinylchloride (PVC) bellows-style filler for 1-inch expansion joints in suspended lay-in acoustical ceilings, selected from the following options:
 - a. Allway HC/HC W Series; Construction Specialties, Inc.
 - b. DX Series; M M Systems Corp.
 - c. Wabo Fast Wrap CES Series; Watson Bowman Acme Corp.
 - d. or approved equal

SECTION 09510 - ACOUSTICAL CEILINGS

PART 3 EXECUTION

3.1 Ceiling Installation:

- A. Suspend main beams spaced at 24 in. or 48 in. o.c., as indicated on Drawings, from structure above by minimum #12 gauge galvanized wire hangers spaced not more than 48 in. o.c.
- B. Install interlocking cross-tees at 24 in. o.c. to form a 24 in. x 48 in., or 24 in. x 24 in. grid pattern.
- C. System shall be accurately leveled to within 1/8 in. in 12 ft. 0 in. Deflection shall not exceed 1/360 of the span of any component.
- D. Provide matching perimeter molding around separate room areas, abutting walls, and around columns and similar protrusions, unless indicated otherwise.
 - 1. At radiused bulkheads and walls, provide curved wall angle, factory-formed to match diameter of bulkheads and walls; aluminum, finished to match ceiling grid. Field cut and formed edges made up of straight sections will not be permitted.
- E. Where perimeter molding meets expansion joint trim, provide a clear break in the molding equal to no less than the expansion joint width.
- F. Scribe and cut panels at borders and penetrations to provide a neat, precise fit. Coordinate with work of HVAC, plumbing and electrical trades.

3.2 Cleaning:

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09651 - RESILIENT TILE FLOORING

PART I - GENERAL

1.1 SUMMARY

- A. Submittals: As follows:
 - 1. Product Data: For each type of product specified.
 - 2. Samples of each different color and pattern of resilient product specified.
 - 3. Maintenance Data: For resilient floor tile to include in the maintenance manuals specified in Division 1.
- B. Extra Materials: Deliver extra materials to Owner as follows:
 - 1. Furnish not less than one box for each 50 boxes or fraction thereof, of each type, color, pattern, class, wearing surface, and size of resilient tile flooring installed.
 - 2. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
- B. Administrative Requirements
 - 1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.
 - 2. Pre-installation Testing: Conduct pre-installation testing as follows: Provide moisture tests, bond test, and pH test. Provide test reports after confirming compliance with the manufacturer's installation recommendations as part of the shop drawings. DO NOT install flooring unless the tests conform.
- C. Test Installations/ Mock-ups: Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.
 - 1. Mock-Up Size: Minimum of 400SF in a room to be selected.
 - 2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 3. Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.
- D. Sequencing and Scheduling
 - 1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

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2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.3 SUBMITTALS

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions.
- B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.
- C. Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.
- D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- E. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.
- B. Select an installer who is experienced and competent in the installation of Armstrong resilient vinyl composition tile flooring and the use of Armstrong Flooring subfloor preparation products.
 1. Engage installers certified as Armstrong Commercial Flooring Certified Installers
 2. Confirm installer's certification by requesting their credentials.
- C. Fire Performance Characteristics: Provide resilient vinyl composition tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory NFPA, or other testing agency acceptable to authorities having jurisdiction:
 1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

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3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
4. ASTM F 1066 Standard Specification for Vinyl Composition Tile
5. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
6. ASTM F 1861 Standard Specification for Resilient Wall Base
7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
9. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
10. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials

1.5 PROJECT CONDITIONS

- A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F and a maximum temperature of 85°F for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

1.6 WARRANTY

- A. Contractor's Warranty: Provide labor and material to replace the flooring that fails for two-years after the date of Substantial Completion.
- B. Manufacturer's Warranty: Provide labor and material to replace the flooring that fails for five-years after the date of Substantial Completion

PART II - PRODUCTS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following or approved equal.
- B. Vinyl Composition Floor Tile: Products complying with ASTM F 1066 (nonasbestos formulated) and with 12" x 12" x 1/8" thickness. Color and pattern selected from manufacturer's standard package. The pattern for all areas may be as many as three (3) different colors used in a pattern that does not require cut accent color tiles per the Owner's / Architect's direction.
 1. Provide Armstrong Standard Excelon Imperial by AHF Products or approved equal.
 2. Color to be selected by Owner from manufacturer's full range of color options.
- C. Slip-Retardant Tile Flooring
 1. Description: Vinyl tile composed of polyvinyl chloride resin, plasticizers, fillers, pigment, and grit. Tile shall have a nominal 0.020 in. (0.51 mm) thick pattern layer containing aluminum oxide grit.
 2. Tile shall meet size, thickness, indentation, impact, deflection, dimensional stability,

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- resistance to chemicals, squareness, and resistance to heat requirements of ASTM F 1066 Standard Specification for Vinyl Composition Tile, Class 2, through pattern.
3. Provide Armstrong Safety Zone Tile by AHF Products or approved equal, 12 x 12 x 1/8, color to be selected from manufacturer's full range of available choices.
 - D. Vinyl Wall Base: Products complying with ASTM F-1861, Type II, Style B-Coved, 4" high by 1/8" thick. Color selected from manufacturer's standard package.
 - E. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
 - F. Adhesives: Provide high moisture installation and water-resistant type Armstrong S-515 Floor tile adhesive or approved equal recommended by manufacturer to suit resilient products and substrate conditions.
 - G. Moisture Barrier: Provide Armstrong S-462 "Seal Strong" two-part moisture mitigation system or approved equal.
 - H. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

3.1 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e., moisture tests, bond test, pH test, etc.).
- B. Visually inspect flooring materials, adhesives, and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

SECTION 09651 - RESILIENT TILE FLOORING

- F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates regarding conditions existing at the time of installation.

3.03 PREPARATION

- A. Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, mitigate moisture and other defects. Provide Armstrong Flooring S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive or S-463 Level Strong™ cement based self-leveling compound or S-466 Patch Strong™ patching and smoothing compound. Provide S-462 Seal Strong™ two-part moisture mitigation system or approved equal as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems (or approved equal) and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- B. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers, and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate, they must be mechanically removed prior to the installation of the flooring material. Refer to the Armstrong Flooring Guaranteed Installation Systems (or approved equal) and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- C. For Tile High-Moisture Installation Warranty when using S-515 Adhesive, perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in situ* Probes", ASTM F 1869, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" and Bond Tests as described in the Armstrong Flooring Guaranteed Installation Systems (or approved equal), to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 95%. MVER shall not exceed 7 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented provided to the Construction Manager and Architect and retained.
- D. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented, retained and submitted to the Owner, CM and Architect.

SECTION 09651 - RESILIENT TILE FLOORING

3.04 INSTALLATION OF FLOORING

- A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems or that of approved equal manufacturer.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.05 INSTALLATION OF ACCESSORIES

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths if practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- D. Apply metal edge strips where necessary. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.06 CLEANING

- A. Perform initial and on-going maintenance according to the latest edition of the Maintenance Instructions for Vinyl Composition & Bio-Based Tile.
- B. Provide three (3) coats of wax finish. Confirm wax product with Owner.

3.07 PROTECTION

- A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION 09651

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 GENERAL

- A. Submittals: As follows:
 - 1. Product Data: For each type of product specified.
 - 2. Samples: In manufacturer's standard sizes of each product color and pattern specified.
- B. Extra Materials: Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed. Deliver extra materials to Owner.

PART 2 PRODUCTS

- A. Manufacturers
 - 1. Basis-of-Design: Roppe Corporation
 - 2. Johnsonite
 - 3. or Approved Equal
- B. Rubber Cove Wall Base : Pinnacle – Rubber, Vulcanized Thermoset, Standard Toe, 4” high x 1/8” thick, Style B, Cove, Color shall be the manufacturer’s standard choices.
- C. Vented Cove Base: Products complying with ASTM F-1861, Type II, Style B-Coved, 4” high with a 3” toe by 1/8” thick. Color selected from manufacturer's standard package.
- D. Rubber Stair Treads: Provide low profile raised circular treads with rubber non-slip insert of a contrasting color strip to aid the visually impaired.
- E. Rubber Risers: Products of same manufacturer as stair treads and complying with requirements specified in the Resilient Wall Base and Accessory Schedule.
- F. Rubber Accessories: Products complying with requirements specified in the Resilient Wall Base and Accessory Schedule.
- G. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.
- H. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PAT 3 EXECUTION

- A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

- B. Preparation: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- C. Installation: Install resilient products according to manufacturer's written installation instructions.
 - 1. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
 - a. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - b. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - c. Do not stretch base during installation.
 - d. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - e. Form corners on job, from straight pieces of maximum lengths possible, without whitening at bends.
 - 2. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.
 - 3. Apply resilient products to stairs as indicated.
- D. Clean and protect resilient products according to manufacturer's written recommendations. Clean resilient products after installation and not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project.

END OF SECTION 09653

SECTION 09680 – CARPET TILE

PART 1 - GENERAL

- A. Submittals: Submit Product Data for each type of carpet, carpet cushion, and the following:
 - 1. Shop Drawings showing carpet type, color, and dye lot, seam locations, types, and methods; type of subfloor; type of installation.
 - 2. Samples of each type of carpet material required.
 - 3. Schedule of carpet using same room designations indicated on Drawings.
 - 4. Maintenance data for carpet and cushion to include in the operation and maintenance manual.

- B. Carpet Surface Flammability: Passes CPSC 16 CFR, Part 1630.
 - 1. Flame Spread: 25 or less per ASTM E 84.
 - 2. Smoke Developed: 450 or less per ASTM E 84.

- C. Project Conditions: Comply with CRI 104, Section 6: "Site Conditions."

- D. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F (12.7 deg C).

- E. Subfloor Alkalinity Conditions: A pH range of 5 to 9 when subfloor is wetted with potable water and Hydrion paper or approved equal is applied.

- F. Attic Stock: Furnish two (2) cases of carpet tile, packaged with protective covering for storage, and identified with labels clearly describing contents, before installation begins. The carpet attic stock must be from the same run and dye lot as the carpet installed on the project.

PART 2 - PRODUCTS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in each carpet Product Data sheet at end of this Section or approved equal.

- B. Concrete-Slab Primer: Non-staining type as recommended by the following:
 - 1. Carpet manufacturer.

- C. Trowelable Underlayments and Patching Compounds: As recommended by the following:
 - 1. Carpet manufacturer.

- D. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated and to comply with flammability requirements for installed carpet as recommended by the following:
 - 1. Carpet manufacturer.

SECTION 09680 – CARPET TILE

- E. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the following:
 - 1. Carpet manufacturer.
- B. Level subfloor within 1/4 inch in 10 feet (6 mm in 3 m), noncumulative, in all directions.
 - 1. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the following:
 - a. Carpet manufacturer.
- C. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.
- D. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.
- E. Concrete-Subfloor Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by the following:
 - 1. Carpet manufacturer.
- F. Carpet with Attached-Cushion Backing Installation: Comply with CRI 104, Section 10: "Attached Cushion."
- G. Comply with carpet manufacturer's recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Bind or seal cut edges as recommended by carpet manufacturer.
- H. Install pattern parallel to walls and borders.
- K. Vacuum carpet using commercial machine with face-beater element.
- L. Protection: Comply with CRI 104, Section 15: "Protection of Indoor Installation."
- M. Provide PVC vinyl extrusion edge at all carpet edges and steps. See Electrical; Drawings for aisle and step lighting layout. Provide PVC snap-in lens cover for carpet edges without lighting.

SECTION 09680 – CARPET TILE

Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in the following carpet Product Data sheets or approved equal.

CP-1: CARPET TILE

Manufacturer	Mohawk Group or Approved Equal
Brand	Mohawk
Style Name/Number	Adopt a Plan GT466
Construction	Tufted
Surface Appearance	Textured Patterned Loop
Tufted Weight	18 oz/yd ² (510 g/m ²)
Gauge	1/12" (47.00 rows per 10 cm)
Dye Method	Solution Dyed
Fiber type	Duracolor, Premium Nylon
Stain Release Technology	Permanent, Built into the Fiber
Soil Release Technology	Sentry Soil Protection
GSA Stain Release Rating	Passes
Backing Material	EcoFlex ONE
Indoor Air Quality	Green Label Plus Certified # 1098
NSF 140	Platinum
Size	24" x 24" (.6096 m x .6096 m)
Installation Method	Vertical Ashlar/Multi-Directional
Foot Traffic Recommendation (TARR)	Heavy Traffic
Flammability	ASTM E 648 Class 1 (Glue Down)
Smoke Density	ASTM E 662 Less than 450
Static Propensity	AATCC – 134 Under 3.5 KV
Warranties:	Lifetime Limited Modular Warranty, Lifetime Limited Duracolor Stain Warranty, Lifetime Static

SECTION 09680 – CARPET TILE

CP-2: TRAFFIC TILE

Manufacturer	Mohawk Group or Approved Equal
Brand/Collection	Mohawk Group / Tuff Stuff II
Style Name/Number	Step In Style II / GT312
Construction	Tufted
Surface Appearance	Textured Performance Cut and Loop
Gauge	5/32" (25.2 rows per 10 cm)
Tufted Weight	30 oz/yd (1017 g/m)
Dye Method	Solution Dyed
Fiber type	Duracolor Premium Nylon
Stain Release Technology	Permanent, Built into the Fiber
Soil Release Technology	Sentry Soil Protection
Backing Material	EcoFlex NXT
Indoor Air Quality	Green Label Plus Certified # 1098
NSF 140	Gold
Size	24" x 24" (.6096 m x .6096 m)
Installation Method	Quarter Turn
Foot Traffic Recommendation (TARR)	Severe Traffic
Flammability	ASTM E 648 Class 1 (Glue Down)
Smoke Density	ASTM E 662 Less than 450
Static Propensity	AATCC – 134 Under 3.5 KV
Warranties:	Lifetime Limited Modular Warranty, Lifetime Duracolor Stain Warranty, Lifetime Static

END OF SECTION 09680

SECTION 09705 - RESINOUS EPOXY FLOORING

PART I GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Resinous flooring includes penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments, a two-component, general service epoxy coating and a selected, graded aggregate.
- B. Project Specific Lines, Graphics, Etc. shall include use of (2) colors, a field color and an accent color. Accent color shall be used to provide solid, infilled rectangles to designate the size and location of the vehicles to be parked in specific areas of the floor. The approximate size and quantity of anticipated vehicles are shown on the floor plan. The installer will be provided a dimensioned floor plan with final vehicle sizes and locations during the construction shop drawing submittal process. Installer must provide a crisp, straight edge between colors. Submit quality control sample for review and acceptance prior to installation.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.
- B. Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.
 - 1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.
 - 2. Submit surface textures for Owner/Architect's selection.

1.04 QUALITY ASSURANCE

- A. **SINGLE SOURCE RESPONSIBILITY & REQUIRED MANUFACTURER'S QUALITY CONTROL**: Obtain all resinous flooring materials including resins, hardening agents, aggregates, grouts, finish or sealing coats, joint materials from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least ten projects of similar size and complexity using Stonhard, General Polymers or Sika or approved equal. Manufacturer must supply full-time manufacturer employed project manager during project installation duration. It is understood that some manufacturer's may not offer this oversight as a standard practice. In that case, the Contractor shall make special arrangements and the Contractor shall engage the manufacturer to provide independent, quality control onsite inspections to meet the general intent of this requirement. At a minimum, the designated manufacturer's representative shall, 1) Meet on site at the Pre-Installation Conference to review all

SECTION 09705 - RESINOUS EPOXY FLOORING

materials, methods, job site specific details, etc. 2) Review completed prep work and submit Record photos and written summary including confirming moisture tests results and acceptability of test results and completed prep work prior to the Contractor proceeding further with installation, 3) make daily inspections of the work and submit Record photos and written summary of work in place, including confirming acceptability and/or recommendations to correct or alter work and/or work practices, 4) make post installation inspection of completed work and submit Record photos and written summary of completed work, including confirming acceptability and/or recommendations to correct and/or any observed potential compromising conditions (i.e. pin holes, bubbles, etc.).

- B. Pre-Installation Conference
 - 1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
 - 2. Attendance
 - a. General Contractor
 - b. Architect/Owner's Representative
 - c. Manufacturer's Representative
 - d. Installer's Representative
 - 3. Submit written, Record summary of attendees and all materials, methods, job site specific details, etc. reviewed during on site conference.
- C. ISO 9002: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9002 registered quality system.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.
- B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.
- C. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85°F/16 and 30°C.

1.06 PROJECT CONDITIONS

- A. Type-1 Concrete substrate shall have a vapor barrier and be properly cured for a minimum of 30 days. **Conduct ASTM F-2170 and report RH data to the project team. Manufacturer to accept slab conditions and RH levels guaranteeing that the proposed system will adhere properly to the substrate.**
- B. Utilities, including electric, water, heat (air temperature between 60 and 85°F/16 and 30°C) and finished lighting to be supplied by General Contractor.
- C. Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

SECTION 09705 - RESINOUS EPOXY FLOORING

- D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.07 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of three (3) full year from date of installation.
NO EXCEPTIONS: It is understood that some manufacturer's may not offer this 3 Year Material and Labor Warranty as a standard practice. In that case, the Contractor shall make special arrangements and procure the required warranty from the manufacturer or otherwise provide an extended Maintenance Bond to specifically satisfy this requirement.

PART II PRODUCTS

2.01 COLORS

- A. Colors: As selected by Owner from manufacturer's standard colors.

2.02 EPOXY FLOORING

- A. Basis of Design: Stonclad GS coated with Stonkote HT4 Novolac with Texture #2 as manufactured by Stonhard, Inc. (or approved equal), Maple Shade, NJ, (800) 257-7953 is a nominal 1/4"/6mm thick system comprised of a penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments, a two-component, 100% solids, general service, epoxy coating and a selected, graded aggregate. Alternatively, complete systems meeting the same requirements, manufactured by Sherwin Williams/General Polymers TPM #115 coated with #3746 and then Novo-Flo or Sikafloor Epo-Rok coated with 264 then SikaGard Duochem 7500 Novolac. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals.

- 1. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

Compressive Strength	10,000 psi
(ASTM C-579)	
Tensile Strength	1,750 psi
(ASTM C-307)	
Flexural Strength.....	4,000 psi
(ASTM C-580)	
Hardness.....	85-90
(ASTM D-2240/Shore D Durometer)	
Bond Strength	>400 psi
(ASTM D-4541)	(100% concrete failure)
Impact Resistance.....	> 160 in. lbs.
(ASTM D-4226)	
Abrasion Resistance.....	0.08 gm max. weight loss
(ASTM D-4060, Taber Abrader CS-17 wheel)	

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Coefficient of Friction.....	0.75
(ASTM D-2047/Neoprene-Dry)	
Flexural Modulus of Elasticity.....	2.0 x 10 ⁶ psi
(ASTM C-580)	
Flammability	Self Extinguishing
(ASTM D-635)	Extent of burning 0.25 inches max.
Thermal Coefficient of	
Linear Expansion	1.8 x 10 ⁻⁵ in/in°C
(ASTM C-531)	
Water Absorption.....	0.2%
(ASTM C-413)	
Heat Resistance Limitation	140°F/60°C
	(for continuous exposure)
200°F/93°C
	(for intermittent spills)
Cure Rate allow	8 hours for foot traffic
(at 77°F/25°C)	24 hours for normal operations

2.03 JOINT SEALANT MATERIALS

- A. Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated.

PART III EXECUTION

3.01 PREPARATION

- A. Substrate: Concrete preparation shall be by mechanical means only and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance. Surface profile achieved shall be similar to medium grit sandpaper. No acid etching or water blasting permitted.

3.02 APPLICATION

- A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.
- B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.
- C. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.

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- D. Coating/Texture: Remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating and texture according to manufacturer's recommended procedures. Squeegee apply and backroll textured coating with strict adherence to manufacturer's installation procedures and coverage rates.

3.03 FIELD QUALITY CONTROL

- A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.
- B. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.
- C. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.
- D. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.04 CURING, PROTECTION AND CLEANING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 09900 – PAINTING

1.1 GENERAL

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint all exposed surfaces. Block fill prime paint all CMU walls full height to the roof deck above ceiling and behind all built in casework, lockers, etc. Paint ALL CMU walls with block filler including but not limited to behind metal stud furred out finished wall. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces. If the schedules do not indicate color or finish, the Owner will select from standard colors and finishes available.
- C. Do not paint prefinished items, finished metal surfaces, operating parts, and labels.
1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Submittals: For each paint system specified, provide the following:
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated. After color selection, the Architect will furnish color chips for surfaces to be coated.
- F. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 3. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - a. Concrete: Provide two 4-inch- (100-mm-) square samples for each color and finish.
 - b. Concrete Masonry: Provide two 4-by-8-inch (100-by-200-mm) samples of masonry for each finish and color.
 - c. Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm) samples of natural- or stained-wood finish on actual wood surfaces.
 - d. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat

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metal and two 8-inch- (200-mm-) long samples of solid metal for each color and finish.

- G. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- H. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
 - 1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface as specified.
 - e. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
- I. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.
- J. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers in clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
- K. Project Conditions: Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- L. Additional Material: Provide one gallon for each 200 gallons paint used in each color and type (minimum one gallon) to Owner.

1.2 PRODUCTS

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers.
- C. Colors: Match colors indicated by reference to manufacturer's color designations.

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1.3 EXECUTION

- A. Examine substrates, areas, and conditions under which painting will be performed for compliance with paint application requirements. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.
- C. Preparation: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
 - 1. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - f. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - 2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

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3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - d. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- F. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 2. Use only thinners approved by paint manufacturer and only within recommended limits.
- G. Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors and finishes shall be selected during construction. Contractor shall allow for use of up to (4) four different wall colors and (2) two different trim colors throughout the building interior, including use of accent walls and use of different colors within the same room/space. Contractor shall allow for use of (2) two different exterior paint colors. Additionally, the contractor may have to color match and paint items to match immediately adjacent pre-finished items and existing items as necessary throughout construction.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in items are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 8. Sand lightly between each succeeding enamel or varnish coat.
- H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has

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- cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- K. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- L. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- N. Field Quality Control: The Owner reserves the right to engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
1. The testing agency will perform appropriate tests as required by the Owner.
 2. If tests show material being used does not comply with specified requirements, the Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.
- O. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

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- P. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- Q. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.
- R. Paint Schedules: Provide the following paint systems for the various substrates indicated by Sherwin Williams (SW), PPG Paints or approved equal products:
- S. **Exterior Paint Systems:**
1. Ferrous Metal:
 - a. Full gloss enamel finish - rust inhibitive primer with acrylic finish
Primer: SW: Pro Industrial Pro-Cryl Universal Primer
PPG: Pitt-Tech Plus DTM Acrylic Primer 4020
1st Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
2nd Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
 2. Non-Ferrous Metal and AESS Steel Finish:
 - a. Full gloss enamel finish - galvanized metal primer with acrylic finish (Lintels, Railings, Bollards, columns, canopy frames, etc.)
Primer: SW: Pro Industrial Pro-Cryl Universal Primer
PPG: Pitt-Tech Plus DTM Acrylic Primer 4020
1st Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
2nd Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
 - b. AESS Steel finish shall be level 4 and finish painted in a controlled environment shop offsite.
- T. **Interior Paint Systems:**
1. Concrete, Masonry (not including CMU):
 - a. Acrylic epoxy
Primer: SW: Loxon Concrete & Masonry Primer
PPG: Paints Speedhide zero Interior Latex Primer 6-4900XI
2nd Coat: SW: Pro Industrial Pre-Catalyzed Epoxy
PPG: Paints Pitt Glaze W B1 Pre-Catalyzed Epoxy 16-xxx
3rd Coat: SW: Pro Industrial Pre-Catalyzed Epoxy
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx

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2. Concrete Masonry Units (CMU): Typical Walls (Block fill prime paint all CMU walls full height and behind all built in casework, lockers, etc.)
 - a. Acrylic epoxy – eggshell finish
 - Filler: SW: Loxon Acrylic Block Surfacer
PPG: Paints Speedhide Latex Block Filler 6-15XI
 - 2nd coat: SW: ProIndustrial Pre-Catalyzed Epoxy, eggshell
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-310
 - 3rd Coat: SW: ProIndustrial Pre-Catalyzed Epoxy, eggshell
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-310
 - b. Acrylic epoxy – semi-gloss finish (Kitchen areas)
 - Filler: SW: Loxon Acrylic Block Surfacer
PPG: Paints Speedhide Latex Block Filler 6-15XI
 - 2nd coat: SW: Pro Industrial Pre-Catalyzed Epoxy, semi-gloss
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-510
 - 3rd Coat: SW: Pro Industrial Pre-Catalyzed Epoxy, semi-gloss
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-510
3. Drywall and Plaster:
 - a. Acrylic latex
 - Primer: SW: ProMar 200 Zero VOC Interior Latex Primer
PPG: Paints Speedhide zero Interior Latex Primer 6-4900XI
 - 2nd Coat: SW: Pro Industrial Pre-Catalyzed Waterbased Epoxy
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
 - 3rd Coat: SW: Pro Industrial Pre-Catalyzed Waterbased Epoxy
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
4. Wood:
 - a. Acrylic epoxy
 - Primer: SW: Multi-Purpose Interior/Exterior Latex Primer Sealer
PPG: Paints Seal Grip Interior Primer/Finish 17-951
 - 2nd Coat: SW: ProIndustrial Pre-Catalyzed Epoxy
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
 - 3rd Coat: SW: ProIndustrial Pre-Catalyzed Epoxy
PPG: Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
 - b. Transparent Stain with urethane finish
 - 1st coat: SW: Minwax Wood Finish 250 Stain
PPG: Deft Interior Low VOC Oil Stain DFT400
 - 2nd Coat: SW: Minwax Polycrylic
PPG: Deft Waterbased Polyurethane DFT 15x
 - 3rd Coat: SW: Minwax Polycrylic
PPG: Deft Waterbased Polyurethane DFT 15x

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5. Ferrous Metal:
 - a. Gloss Finish - rust inhibitive primer with acrylic finish
 - Primer: SW: Pro Industrial Pro-Cryl Universal Primer
PPG: Pitt Tech Plus DTM Acrylic Primer 4020
 - 1st Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
 - 2nd Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
6. Non-Ferrous Metal (New Galvanized and Aluminum):
 - Primer: SW: ProIndustrial Pro-Cryl Primer
PPG: Pitt Tech Plus DTM Acrylic Primer 4020
 - 1st Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
 - 2nd Coat: SW: Pro Industrial DTM Acrylic Finish, semi-gloss
PPG: Pitt-Tech Plus EP Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel, 90-1610 Series.
7. Concrete Floors – light traffic (janitor closets and utility spaces)
 - Primer: SW: ArmorSeal Tread-Plex Water Based Acrylic Primer
PPG: Breakthrough Satin Acrylic V51 Series
 - 2nd coat: SW: ArmorSeal Tread Plex Water Based Acrylic Finish
PPG: Breakthrough Satin Acrylic V51 Series
8. Concrete Floors – High Traffic Epoxy
 - Primer: SW: ArmorSeal 8100 Urethane Epoxy @ 3.0-5.0 mils dft
PPG: Aquapon WB EP Waterborne Epoxy Series 98E @ 2.0 mils dft
 - 2nd coat: SW: ArmorSeal 8100 Urethane Epoxy @ 3.0-5.0 mils dft
PPG: Aquapon WB EP Waterborne Epoxy Series 98E @ 2.0 mils dft
9. Concrete Floors – Heavy Duty Vehicular Traffic Epoxy (Garages/Apparatus Bays)
 - Primer: SW: ArmorSeal 33 Epoxy Primer @ 8.0 mils dft
PPG: PPG Flooring 912 LV (ICO Primer LV) @ 8 mils dft
 - 2nd coat: SW: ArmorSeal 1000 HS 2-Part Polyamide Epoxy @ 3.0-5.0 mils dft
PPG: PPG Flooring 610 (ICO Guard Coating) – 100% solids epoxy floor coating. Install at one coat – 12-15 mils dft
 - 3rd coat: SW: ArmorSeal 1000 HS 2-Part Polyamide Epoxy @ 3.0-5.0 mils dft
PPG: 3rd coat Not Required
 - Additive: Include manufacturer recommended anti-slip additive. Provide samples for selection by Owner, (3) minimum, fine, medium-fine and medium.

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10. Exposed Ceiling Deck – Dryfall coating
- Primer – Ferrous Metal:
 - SW: Pro Industrial Pro-Cryl Universal Primer
 - PPG: Pitt-Tech Plus DTM Acrylic Primer 4020
 - Primer – Non-Ferrous Metal:
 - SW: Pro Industrial Pro-Cryl Universal Primer
 - PPG: Pitt-Tech Plus DTM Acrylic Primer 4020
 - Finish 1-2 coats:
 - SW: Pro Industrial Waterborne Acrylic Dryfall
 - PPG: Speedhide Super Tech Flat Dryfall 6-725XI

END OF SECTION 09900

SECTION 10425 – SIGNS: CAST METAL PLAQUES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cast Metal Plaque(s)

1.2 SHOP DRAWINGS

A. Submittals

1. Shop Drawings: Provide a shop drawing for the Cast Metal Plaque. Provide plans, elevations, and sections showing typical members, anchors, layout, reinforcement, accessories, and installation details. Provide the following:

- a) The Architect will provide a graphic layout of the text with the Owner's seal or logo.
- b) Provide a drawing to scale for Owner approval.
- c) Upon Owners approval of the text provide a full-size rubbing for metal plaques.

2. Samples: Provide a color selection material, pattern, and surface texture. **All samples go to the Construction Manager or the Owner.**

B. Unless indicated otherwise provide one (1) Cast Metal Plaque. Location of plaque to be determined by owner.

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

A. Fasteners: Concealed noncorrosive metal.

B. Anchors and Inserts: Nonferrous metal or hot-dipped galvanized. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts for concrete or masonry work.

C. Plaques: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce satin polished finish. Contents of plaques will be supplied by Owner / Architect and may include logos, County Seals, Building Seals, Mascots and Owner requested Graphics. Plaque size = 24" x 30"

1. Metal: Bronze
2. Border Style: Raised flat band.

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3. Background Color and Texture: Provide Manufacturer's standard finishes for Owner's Selection.
- D. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

PART 3 EXECUTION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
- C. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- D. Remove temporary protective coverings and strippable films.
- E. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10425

SECTION 10426 – INTERIOR ROOM SIGNS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior Room signage

1.2 SHOP DRAWINGS

- A. Submittals
 - 1. Shop Drawings: Provide a shop drawing for the Interior Room Signs. Provide plans, elevations, and sections showing typical members, anchors, layout, reinforcement, accessories, and installation details. Provide the following:
 - a) A signage spread sheet with each door location, room name, room number and detailed layout.
 - b) Setting drawings, templates, and directions for installing anchors.
 - c) Full-size spacing templates for dimensional letters.
 - 2. Samples: Provide a separate physical sample of the color selection material, pattern, and surface texture for each of the signage types listed above in 1.1.A. **All samples go to the Construction Manager or the Owner.**
 - 3. Provide an additional ten (10) Interior Room Signs. The text and format will be provided by the Construction Manager or Owner.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

- A. Basis of Design: VISTA Sign Systems or approved equal
 - 1. Standard Room Sign: Curved Vista Wall Sign 7.87" x 4.1575" x 0.84" with 1mm Glossy/Non-Glare lens with standard ADA tactile and Braille and digitally printed 10 mil double-sided matte rigid PVC film insert
 - a) V200 (200mm/7.87") aluminum sign holder extrusion, Clear Anodized, 4.1575 inch.
 - b) CC200 - Clear cover (Glossy/Non-Glare) for V200 extrusion (1mm thick), Glossy/Non-glare, 4 inch.
 - c) 2 PEC200 - Plastic (ABS) end caps for V200 extrusion, Black.
 - d) CCADA200 - ADA Lens for V200 extrusion (7.8" / 198mm)

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2. Standard Room Sign (Bathrooms, Elevators, Area of Refuge and Room Occupancy) 7.87" x 8" x 0.84" with 1mm Glossy/Non-Glare lens with standard ADA tactile and Braille and digitally printed 10 mil double-sided matte rigid PVC film insert
 - a) V200 (200mm/7.87") aluminum sign holder extrusion, Clear Anodized, 8 inch.
 - b) CC200 - Clear cover (Glossy/Non-Glare) for V200 extrusion (1mm thick), Glossy/Non-glare, 8 inch.
 - c) 2 PEC200 - Plastic (ABS) end caps for V200 extrusion, Black.
 - d) CCADA200 - ADA Lens for V200 extrusion (7.8" / 198mm)
- B. Fasteners: Concealed noncorrosive metal.
- C. Anchors and Inserts: Nonferrous metal or hot-dipped galvanized. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts for concrete or masonry work.
- D. Graphic Content and Style: Provide sign copy that complies with size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices. Also include braille lettering to meet the handicapped ADA requirements and 2021 IBC New Jersey Edition Code.

PART 3 EXECUTION

- A. General: Install using mounting methods indicated and according to manufacturer's written instructions.
 1. Install level, plumb, true to line, and at locations and heights indicated, with surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Signage Used for Room Identification: Install in locations on walls as indicated and according to ADA accessibility standards.
- C. Mounting Methods:
 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.

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- b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 3. Brackets: Remove loose debris from substrate surface and install bracket supports in position so that sign is correctly located and aligned.
 - 4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 5. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - 6. Shim-Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate.
- D. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
 - E. Remove temporary protective coverings and strippable films as signs are installed.
 - F. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner

END OF SECTION 10426

SECTION 10427 – SIGNS: INTERIOR MARKINGS AND IDENTIFICATION SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior Marking and Identification Signage

1.2 SHOP DRAWINGS

A. Submittals

1. Shop Drawings: Provide a shop drawing for the Interior Marking and Identification Signage. Provide a plan showing the layouts and locations of the signage required by the 2018 IBC New Jersey Edition and/or local authority having jurisdiction.

a) Provide shop drawings of concealed space identification

1. Floor plan with all firewalls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations located.
2. Message list for each sign with wording and letter layout.

1.3 MARKINGS AND IDENTIFICATION

A. At all new or existing firewalls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations within the work area where there is accessible concealed floor, floor-ceiling or attic space provide permanent signage in the concealed space as follows.

1. Signage to be either signs or stenciled.
2. Be located within 15 feet of the end of each wall and in intervals not exceeding 30 feet measured horizontally along the wall or partition.
3. include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in contrasting color.
4. Wording: “FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS” or other wording.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 EXECUTION

A. Install level, plumb, true to line, and at locations and heights indicated, with surfaces free of distortion and other defects in appearance.

SECTION 10427 – SIGNS: INTERIOR MARKINGS AND IDENTIFICATION SIGNAGE

1. Before installation, verify that surfaces are clean and free of materials or debris that would impair installation.

END OF SECTION 10427

SECTION 10429 – SIGNS: EXTERIOR DIMENSIONAL LETTERS

Part 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior dimensional letters.

1.2 SUBMITTALS

A. Submittals

1. Shop Drawings: Provide a shop drawing for the Exterior dimensional letters. Provide plans, elevations, and sections showing typical members, anchors, layout, reinforcement, accessories, and installation details. Provide the following:
 - a) Provide a graphical layout based on the Contract Document Elevations.
 - b) Provide a drawing to scale for approval.
2. Samples: Provide a color selection material, pattern, and surface texture. **All samples go to the Construction Manager or the Owner.**

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

Part 2 PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet: Alloy and temper recommended by manufacturer for use and finish indicated with not less than the strength and durability properties of ASTM B 209, alloy 5005-H15.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use and finish indicated with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
- C. Aluminum Castings: Alloy and temper recommended by manufacturer for casting process, use, and finish indicated.
- D. Fasteners: Use fasteners fabricated from metals that are not corrosive to sign material and mounting surface.

SECTION 10429 – SIGNS: EXTERIOR DIMENSIONAL LETTERS

- E. Anchors and Inserts: Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.2 DIMENSIONAL LETTERS

- A. Cast Letters: Individual characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into back of characters and tap to receive threaded mounting studs.
 - 1. Metal: Aluminum
- B. Fabricated Letters: Metal, form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories.
 - 1. Aluminum Sheet: Not less than 0.090 inch (2.3 mm) thick for front and not less than 0.063" for returns. Fabricate by heliarc welding process.
 - 2. Letter Style: TBD Owner to select from manufacturer's full range of available standard typestyles, 5 minimum.

2.3 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other appearance characteristics, provide color matches as selected from manufacturer's full range, unless otherwise indicated.
- B. Aluminum:
 - 1. Painted Finish: Modified-acrylic enamel system.
 - a. Custom color required. Match Owner's paint sample.

Part 3 EXECUTION

3.1 INSTALLATION

- A. Install signs level, plumb, and at height indicated on the drawings, with sign surfaces free from distortion or other defects in appearance.
- B. Dimensional Letters: Mount letters and numbers using standard fastening methods recommended by manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Use heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Projected Mounting: With letter backs separated from wall surface by one-half inch (1/2").

SECTION 10429 – SIGNS: EXTERIOR DIMENSIONAL LETTERS

- C. Remove and replace damaged or deformed letter that do not comply with specified requirements. Replace letters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- D. Remove temporary protective coverings and strippable films.
- E. On completion of installation, clean exposed surfaces according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10429

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

1.1 GENERAL

- A. Submittals: Submit the following:
 - 1. Product Data: Include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
 - 2. Samples for Initial Selection: Manufacturer's color charts showing full range of colors, textures, and patterns available for each finish indicated or exposed to view.
- B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated.
- C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.
- D. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

1.2 PRODUCTS

- A. Fire Extinguishers: Provide fire extinguishers for each cabinet and for other locations indicated.
 - 1. Multipurpose Dry Chemical Type: Type MP-10, UL-rated 4-A:60-B:C, 10 lb nominal capacity, in enameled steel container.
 - 2. Class "K" high hazard area (kitchen and food classroom) dry chemical 4-A, 60:B:C, 10 lb. capacity in enameled steel container.
 - 3. Multipurpose Dry Chemical Type: UL-rated 2-A:10:B:C, 5 pound nominal capacity in steel container to hang on bracket in classroom or office.
 - 4. Provide certified inspection tags per local code requirements for all fire extinguishers provided.
- B. Cabinet Construction: Box with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
 - 1. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.
 - 2. Cabinet Type: Suitable for containing the following:
 - a. Fire extinguisher.
 - 3. Cabinet Mounting: Suitable for the mounting indicated:
 - a. Semi-recessed: Partially recessed in walls of shallow depth.
 - 4. Trim Style: One piece with corners mitered, welded, and ground smooth.
 - a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge.
 - 1) Rolled-edge with 2-1/2-inch backbend depth.
 - 2) Metal: Same metal and finish as door.

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

- C. Door Material and Construction: Manufacturer's standard of material indicated, coordinated with cabinet types and trim styles selected.
 - 1. Enameled Steel: Hollow construction with tubular stiles and rails.
 - 2. Door Glazing: Fully tempered float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, and Class as follows:
 - a. Class 1 (clear).
 - 3. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.
 - a. Application Process: Silk screen.
- D. Door Style: Manufacturer's standard design.
 - 1. Full-Glass Panel: Fully tempered, Float glass, 1/8 inch thick.
- E. Door Hardware: Provide door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.
- F. Cabinet Finishes: Comply with NAAMM "Metal Finishes Manual." Protect exposed finishes from damage by application of temporary strippable covering prior to shipment.
- G. Steel Cabinet Finishes: Solvent-clean surfaces to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust from uncoated steel.
 - 1. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply a two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 2.0 mils.
 - a. Color and Gloss: In addition to manufacturer's standard "white", provide a minimum of 8 other painted finish options for review and selection by Owner. Paint the following:
 - 1) Exterior of cabinet except for surfaces indicated to receive another finish.
 - 2) Interior of cabinet.

1.3 EXECUTION

- A. Installation: Follow manufacturer's printed instructions.
- B. Install at heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities and meet State and handicapped codes and ADA requirements.
 - 1. Prepare wall recesses for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

1.1 GENERAL

- A. Submittals: Manufacturer's product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, mounting methods, specified options, and finishes.
- B. Samples: Full-size samples of the following toilet accessory items to verify design, operation, and finish requirements. Acceptable samples will be returned and may be used in the Work:
 - 1. Hand dryer.
 - 2. Stainless steel framed mirror unit.
 - 3. Toilet tissue dispenser.
 - 4. Soap Dispenser.
 - 5. Grab Bar.
 - 6. Waste Receptacle.
 - 7. Sanitary Napkin Disposal.
 - 8. Napkin/Tampon Vendor.
 - 9. Trash Container.
 - 10. Toilet seat cover dispenser

1.2 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, all items shown in this section are Bobrick Products. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:
 - 1. A & J Washroom Accessories
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation
 - 5. General Accessory Manufacturing Co.
 - 6. McKinney/Parker
 - 7. Kimberly/Clark
 - 8. Georgia Pacific
- B. Materials, General: Fabricate toilet accessory items from the following materials and according to requirements specified for individual accessory items:
 - 1. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness, unless otherwise indicated.
 - 2. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
 - 3. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum thickness, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.
 - 4. Galvanized Steel Sheet: ASTM A 527, G60.
 - 5. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

SECTION 10800 - TOILET AND BATH ACCESSORIES

6. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.
 7. Mirror Glass: Tempered Glass Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
 8. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
 9. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.
 10. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide a minimum of six keys to Owner's representative.
- C. Double-Roll Toilet Tissue Dispenser: Size to accommodate core type tissue to twin roll, high impact plastic finish body. Georgia Pacific #59209 or approved equal.
- D. Surface Mounted Hand Dryer: Automatic sensor operated, 110-120V by Excel Dryer, Inc. Model XL-___ (color selected by Owner/Architect) or approved equal.
- E. Waste Receptacle: 22 gallons with funnel top. Rubbermaid #3546 and #3548 top or approved equal.
- F. Trash Container: 28 ½ quarts, Rubbermaid #2956 and #3066 or approved equal.
- G. Surface-Mounted Soap Dispenser: Holds 1 Lt. foam skin cleanser, high impact plastic finish Kimberly/Clark Model 92144 or approved equal.
- H. Surface-Mounted Napkin/Tampon Vendor: Stainless steel all weld construction. 22 GA cabinet, 18 GA door, coin operation American Specialties, Inc. 0864 or approved equal.
- I. Surface-Mounted Sanitary Napkin Disposal: Stainless steel construction, Bobrick B-254 or approved equal.
- J. Stainless Steel Grab Bars: Provide grab bars with wall thickness not less than .050 inch (18 gage), Bobrick Model B-6806 or approved equal and as follows:
1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
 2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
 3. Gripping Surfaces: Smooth, satin finish.
 4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.
- K. Stainless Steel Channel-Framed Mirror Units: Fabricate frame with channel shapes not less than 0.04 inch (20 gage), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430, bright polished finish. Bobrick Model B-165 Series or approved equal.
- L. Fabrication: Only a maximum 1-1/2-inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a waterproof, printed label or a stamped nameplate, indicating manufacturer's name and product model number.

SECTION 10800 - TOILET AND BATH ACCESSORIES

- M. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless-steel piano hinge. Provide concealed anchorage wherever possible.
- N. Framed Mirror Units, General: Fabricate frames for tempered glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- O. Mirror Unit Hangers: Provide system of mounting mirror units that will permit rigid, tamperproof, and theft-proof installation, as follows:
 - 1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- P. Toilet Seat Cover Dispenser: Georgia Pacific Model # 57710 (White) or approved equal.

1.3 EXECUTION

- A. Installation: Install toilet accessory units according to manufacturers' printed installation instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
 - 1. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set the units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.
 - 2. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
 - 3. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 11040 - CLASSROOM/OFFICE FURNITURE AND MISCELLANEOUS EQUIPMENT

1.1 GENERAL

- A. Submittals: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
1. Product data for each type of classroom furniture and miscellaneous equipment specified.
 2. Shop drawings detailing each type of classroom furniture and miscellaneous equipment assembly, and indicating details, layout and individual unit dimensions, required clearances, component parts, method of field assembly, and anchorage to surrounding construction.
 3. Samples: 6" by 6" samples of each exposed finish required.

1.2 PRODUCTS

All manufacturers and model numbers listed below are for specification of design intended. "Or approved equal" will be accepted if item meets or exceeds the specified number.

- A. Bulletin Board: (Item #133, #135, #136) 6'-0" x 4'-0", 4'-0" x 4'-0", 8'-0" x 4'-0", aluminum frame cork bulletin board Series 900 by Claridge or approved equal.
1. Surface quality natural cork is reinforced with sturdy back panels. Frames are of 1-1/4" satin finish aluminum. Factory assembled and equipped with concealed hangers for permanent wall fastening individually packed.
- B. White Board: (Item #139, #142) 12'-0" x 4'-0", 4'-0" x 4'-0" aluminum frame with white LCS writing surface. LCS 24 by Claridge or approved equal.
1. White porcelain enamel writing surface.
 2. Heavy satin aluminum frame.
 3. Full width top map rail with cork insert.
 4. Full width chalk trough at bottom. (Series 1)
 5. Provide optional flag holder and five map clips for each board assembly (one set per classroom minimum).
 6. Music Room has ruled white board as noted.
 7. #69 has fused lines and lettering by the Owner/Architect.
- C. Fire Extinguisher. See Specification Section 10522.
- D. Surface Mounted Paper Towel Dispenser: (Item #408) Model B-2621 of Bobrick Washroom Equipment, Inc., or approved equal. Dispenser shall be constructed of type 304, 22 gauge (0.8 mm) stainless steel; welded construction. Exposed surfaces shall have satin finish. Door shall be equipped with full length stainless steel piano hinge and a knob latch. Unit shall be capable of dispensing C-fold or 275 multifold paper towels without adjustment of adapters.

SECTION 11040 - CLASSROOM/OFFICE FURNITURE AND MISCELLANEOUS EQUIPMENT

Surface Mounted Paper Towel Dispenser Materials:

1. Cabinet: 18-8, type 304, 22 gauge (0.8 mm), stainless steel with satin finish; welded construction.
2. Door: 18-8, type 304, 22 gauge (0.8 mm), stainless steel with satin finish. Door is attached to cabinet with full length stainless steel piano hinge; secured with knob latch.
3. Operation: Unite dispenses all makes of C-fold and multifold paper towels without adjustment of adapters. Capacity: 200 C-fold or 275 multifold paper towels. Slot in sides of cabinet indicated refill time.
4. Installation: Surface mounted on wall with four screws furnished by manufacturer at four mounting points indicated by "S". For plaster or drywall construction, use screws furnished to provide 1/8" (3mm) toggle bolts; provide concealed backing to comply with local building codes. For masonry wall, use screws furnished by manufacturer with fiber plugs or expansion shields, or provide expansion bolts.

1.3 EXECUTION

- A. Installation: Install units at locations indicated, in continuous ranges made up of number of units shown, complying with manufacturer's instructions. Set units plumb and level; use noncorrosive metal shims as required.
 1. Install accessory items in locations indicated.
- B. Adjust and Clean: Adjust units after installation to ensure that units are level and that moving parts operate freely and in manner intended. Clean exposed surfaces and touch-up or replace damaged marred finishes.

END OF SECTION 11040

SECTION 12242 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roller Shades: Solar type shades that roll into a coil and unroll flat.
 - 2. Provide one (1) shade for every individual window sash at all new replacement windows.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Provide an overall floor plan showing all window shade locations. Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations. Provide a roller-shade schedule on the shop drawing.
- C. Provide Material Samples for Initial Selection: For each type and color of shadeband material.
 - 1. Include samples of accessories involving color selection.
- D. Provide a Typical Window Opening Full Size Mock-up Sample for each type of roller shade.
 - 1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than 12 inches wide by 12 inches long for each type of roller shade indicated.
 - 3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing. In the Shop Drawing, the contractor shall specifically note each deviation or change.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Submit a sample Warranty: Provide the manufacturer's warranty documentation.

SECTION 12242 - ROLLER WINDOW SHADES

- F. Provide an Installer Qualifications and a letter from the manufacturer certifying the installer.
- G. Provide Product Certificates that the product meets the “children’s product” US Consumer Product Safety Commission accepted third-party conformity assessment body. The operating cords must be inaccessible or non-hazardous.
- H. Provide Product Test Reports:
 - 1. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
 - 2. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer trained and certified by the manufacturer having at least ten (10) years’ experience installing products comparable to those specified in this section.
- B. Installer: must be an approved installer meeting all qualifications required by the manufacturer.

1.6 WARRANTY

- A. Roller Shade Hardware and Shadecloth: Manufacturer’s 25-year warranty that all components are free from manufacturing defects from the date of substantial completion.
- B. Roller Shade Installation (Labor and Material): Two (2) years from date of substantial completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from

SECTION 12242 - ROLLER WINDOW SHADES

Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Legrand Clutch Shade System or approved equal.
 - 1. Supplier: Contexture or approved equal
- B. Source Limitations: All shade systems specified in this section shall be provided by one manufacturer.
- C. Basis of Design: TELESHADE system shall be a smooth operating chain and sprocket roller shade system manufactured by Legrand or approved equal. Approved equal substitutions will be considered in accordance with Specification Section 01300-Submittals. Shade shall come pre-assembled to jobsite but allow for reversable chain operation for easy reconfiguration without disassembling the shade system
 - 1. Easy-Lift (Chain operated) Action with infinite positioning. Left hand, right hand or both sides operation available as standard. Provide the chain restraining device.
 - 2. Manual Teleshade shall include a "manual override" requirement that allows the shade to be pulled down by the hembar without using the chain. This operation must be demonstrated onsite with the required sample shade.
 - 3. Provide fully factory assembled shade unit consisting of 2 end brackets, shade tube, extruded aluminum fascia, hembar and fabric.
 - 4. Removal shall not require the disassembly of the shade unit.
 - 5. End Bracket: 3 inches by 3-3/4 inches (77 X 96 mm) end bracket shall be a two piece molded ABS construction with 2-1/2 inches (64 mm) diameter nylon drive sprocket. Brackets color shall co-ordinate with the fascia color.
 - 6. Shade Tube: Extruded aluminum shade tube shall be 1/16 inch (1.52 mm) thick with three internal continuous fins 3/16 inch (4.82 mm) high, for strength and drive capabilities when attached to the nylon sprocket. The fins shall be spaced 120 degrees apart.
 - 7. Fascia: the extruded aluminum fascia shall be 1/16 inch (1.7 mm) thick, complete with two continuous screw flutes, anodized or powder coated as required
 - 8. Drive Assembly: - Factory set for size and travel of shades.
 - a. Capable of being field adjusted from the exterior of the shade unit without having to disassemble the hardware.
 - b. Provided with a built-in shock absorber system to prevent chain breakage, under normal usage conditions.
 - 9. Drive Chain: shall be No. 10 stainless steel bead chain formed in a continuous loop. Chain with 90 pound tensile strength.
 - 10. Exterior Hem-bar: extruded aluminum with plastic end finials.
 - 11. Fabric –Room Darkening Fabric – 0% - Color to be selected from manufacturers standard. Fabric must be NFPA 701 compliant.
 - 12. Front Fascia: Provided by shade contractor.

SECTION 12242 - ROLLER WINDOW SHADES

- a. SnapLoc (or approved equal) Front Fascia: Aluminum extrusion that conceals front and underside of roller and operation mechanism and attaches to roller endcaps without exposed fasteners. Provide for all exposed shades.
 - b. Shape: L-shaped.
13. End Caps: To cover exposed end caps.

2.2 SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to greatest extent possible except as follows:
 1. Railroaded Materials: Railroaded materials due to material roll width not meeting window opening requirements will not be permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

SECTION 12242 - ROLLER WINDOW SHADES

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION 12242

SECTION 12400 – PLASTIC LAMINATE CASEWORK

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Applicable provisions of General Conditions, Special Conditions, and General Requirements shall apply to this section as if repeated in full herein. Reference other Sections and Divisions for work in connection with this section.

1.02 SCOPE OF WORK

- A. Cabinets: Furnish prefabricated cabinetry and related components as specified herein. Refer to plans and equipment lists for details and requirements. Cabinetry shall include all fillers, scribes, finish ends, finish backs, laminate and solid polymer countertops. Locks to be provided where shown on casework drawings or described in equipment lists.
- B. Sinks and Fixtures: Provide sinks, fixtures, electrical outlets, and fittings specified as part of complete model numbered units. Provide materials to appropriate trades for final hook ups and installation.

1.03 RELATED WORK NOT INCLUDED

- A. Sinks and Fittings: Sinks and fittings, connection, piping, traps, supplies, shut offs, and special plumbing applicable to codes. Electrical fittings, devices, conduit, wiring, fans, blowers, motors, ductwork, and special grills not specified as part of furnishings. (Specified in electrical, plumbing, and heating/ventilation/air conditioning sections)
- B. Blocking, Framing and Reinforcements: In walls, ceilings, and floors for cabinetry anchorage and mountings, SHALL BE COORDINATED DURING SHOP DRAWING SUBMITTALS & CONSTRUCTION AND PROVIDED BY GENERAL CONTRACTOR AS NEEDED.
- C. Locks: Master keyed to room doors or specialty locking systems. (Specified in lock section)
- D. Vinyl Base Molding: (Specified in resilient flooring section)

1.04 QUALIFICATION

- A. Casework Standards: Casework is based on Stevens Industries model numbers. Cabinet Construction options are as specified in this section and on Contract drawings. The manufacturers listed below will vary somewhat in exact construction methods included in their base or standard designs but are acceptable as equal manufacturers. Accordingly, any acceptable manufacturer must include the options and/or customized materials and construction methods to meet or exceed the specified design criteria.

1. Case Systems
2. Clearwood
3. Or Approved Equal

SECTION 12400 – PLASTIC LAMINATE CASEWORK

B. Substitutions:

1. Substitutions will be approved in accordance with Specification Section 01300.
2. Contractor shall state in writing any deviations from requirements and specifications. The casework shall conform to the configuration, arrangement, design, material quality, joinery, panel thickness, and surfacing of that specified and shown on drawings.
3. Manufacturers requesting approval shall submit samples with cut-aways showing cabinet construction, joinery, drawer and door construction, hardware, and materials, along with catalogs and specification, in order that accurate evaluations can be made. Manufacturers shall show full sized working samples. Catalogs and specifications shall be submitted with written request, along with detailed list of compliance and deviations from these documents for approval. Samples may be impounded by owner and retained until completion of job for verification and compliance of specifications.
4. Manufacturer must be Architectural Woodwork Institute (AWI) Premium Certified.

1.05 SUBMITTALS

- A. Shop Drawings: Shall be submitted for approval after formal notification of award of contract. Drawings shall consist of floor plans indicating arrangement and relation to adjacent work and equipment and complete elevations of casework. Centerline of service requirements shall be noted for use by other trades. A schedule of all sinks, fittings, and accessories that are part of this contract shall be provided.
- B. Color Samples: Shall be submitted for selection and coordination at time of shop drawing submittals. Samples of actual materials and color shall be available as required.
- C. Catalog Cuts: Additional catalog cuts, details, and samples as requested by architect for evaluation and coordination.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protection: Protect casework and related materials during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.
- B. Storage: Store casework and related materials at project site in installation and storage areas with similar ambient conditions as final installation. Storage areas must be kept dry, heated with low relative humidity, and away from construction work such as painting, wet work, grinding, and similar operations.
- C. Site Conditions: In accordance with AWI's *Quality Standards Illustrated* (current edition).

SECTION 12400 – PLASTIC LAMINATE CASEWORK

1.07 WARRANTY

- A. Casework manufacturer shall warrant for a period of three (3) years that its manufactured product is free from defects in materials and workmanship when properly installed and under normal use and conditions.
- B. Accessory equipment (sinks, fittings, etc.) shall be warranted by appropriate manufacturer's guarantee to the limit of that manufacturer's standard warranties.

PART 2 PRODUCTS

2.01 SURFACE MATERIAL

- A. Cabinet:
 - 1. Exposed finish ends, fronts, modesty panels, and finish backs shall be faced with vertical grade (.028") High Pressure Laminate (HPL), tested under National Electrical Manufacturers Association (NEMA) LD3-2005.
 - 2. Panels with exterior .028 HPL surfaces shall have Cabinet Liner Surface (CLS) (.020") white interior cabinet liner.
- B. Semi-Exposed Interior: Surfaces exposed when doors and drawers are open, but not exposed when door and drawers are closed shall be Cabinet Liner Surface (CLS) (.020") white interior.
- C. Exposed Interior: Surfaces not concealed by doors and drawers (open shelving, lockers, etc.) and surfaces visible thru transparent (glass) doors exposed when doors shall be faced with vertical grade (.028") High Pressure Laminate (HPL), tested under National Electrical Manufacturers Association (NEMA) LD3-2005.
- D. Drawers: Sides, back and sub front shall be constructed of ½" thick particleboard laminated with white melamine. Drawer bottom shall be ½" thick particleboard laminated in white melamine and screwed directly to the bottom of the drawer box. Cabinet with less than ½" thick bottom or painted drawer bottoms will not be acceptable.
- E. Concealed Backs: Shall be ¼" thick white hardboard to match interior of cabinet

2.02 CORE MATERIALS

- A. Particleboard: Shall be high performance industrial grade core. Particleboard shall be 45# - 48# density 3-ply type formation conforming to American National Standards Institute (ANSI) A208.1 and American Society for Testing and Materials (ASTM) D1037-91A standards.
- B. Medium Density Fiberboard: Core shall be minimum 48# density conforming to ANSI A208.1 MD-130 standards.

SECTION 12400 – PLASTIC LAMINATE CASEWORK

- C. Moisture Resistant Core: Interior-Grade moisture resistant particleboard to meet or exceed M-3 Grade, according to ANSI-A208.1-2009 shall be used at all cabinets and counters within 8 feet of any plumbing fixture.

2.03 EDGINGS

- A. Door and Drawer Fronts: Edges shall have 3mm radius extrusion banding. 3mm pattern selection Fronts shall have radius edges and corners utilizing automated hot melt adhesive application and trimming.
- B. Cabinet Edges: Cabinet sides, top, bottom, adjustable shelves, and other interior components shall be edged with (.020") flat edge extrusion. Automated hot melt adhesive application and trimming.
- C. Drawer Components: 3/4" sides shall be edged with (.020") flat edge extrusion. Automated hot melt adhesive application and trimming.
- D. Selections: Edgebanding to match laminate selections based on commercially available patterns, including premium selections to match and coordinate with laminate selected by Owner during construction.

2.04 SELECTIONS AND APPLICATIONS

- A. Exposed: Cabinet finish ends, fronts, modesty panels, and finish back HPL .028 thickness shall be selected from Wilsonart full range of available options including all "premium" laminates (excluding HD laminates) or approved equal.
- B. Interior of Exposed Cabinets (any surface exposed to view when doors and drawers are in closed position) shall be High Pressure Laminate to match the exterior
- C. Semi-exposed Surfaces (surfaces not exposed, completely concealed from view when doors and drawers are in closed position): are to be white .020 cabinet liner
- D. Drawer Interiors: Are to be white
- E. Backs: Shall be matching to Interior of cabinet (White .020 cabinet liner)
- F. Laminate Countertops: Selected from Wilsonart full range of available options including all "premium" laminates (excluding HD laminates) or approved equal.

2.05 HARDWARE

- A. Hinges: Type and finish shall be confirmed during shop drawing submittal process. Contactor shall include use of both types listed below and submit samples of each type with finish choices for selection by Owner. Provide a minimum of five (5) standard finishes. Doors less than 47" shall have two (2) hinges per door. Doors exceeding 47" shall have three (3) hinges per door.

SECTION 12400 – PLASTIC LAMINATE CASEWORK

5-Knuckle Hinges (High Use/Abuse Locations): Shall be heavy duty 5-knuckle 270-degree pivot reveal overlay style. Hinges shall have interlaying leaves 270-degree swing constructed of (.090") thickness steel. Hinges shall be (Grade 1) with hospital ground tips and non-removable pin.

Concealed Hinges (Improved Aesthetic Locations): Shall be fully concealed 170-degree European style hinges.

- B. Door Catches: Shall be 7lb pull magnetic with screws slotted for adjustment
- C. Pulls: Shall be offered in easy grip 4" metal wire type pulls. Provide a minimum of five (5) standard finishes to match and coordinate with exposed hinges.
- D. Full Extension Slides: Full extension ball bearing slides to be an option feature available for all cabinet drawers if selected in specification options. Slides shall be side mounted with profile to not reduce interior drawer space normally provided. Ball bearing slides to be tested under The Business and Institutional Furniture Manufacturer's Association (BIFMA) X5.5 Section 7. Slides shall pass both 50,000 and 100,000 cycle test with a 120# load rating.
- E. Shelf Supports: Adjustable shelf supports shall be injection molded clear polycarbonate. Supports shall incorporate integral molded lock tabs to retain shelf from tipping or inadvertent lift out. Supports shall have 5mm diameter double pin engagement into precision bored cabinet vertical hole patterns. Adjustment shall be (32mm) 1 1/4" spacings. Supports shall have a compression ridge effecting force against shelf edge to maintain positive pin engagement. Supports shall have molded-in screw attachment feature. Static test load shall exceed 200# per clip. Shelf spans above 27" shall have 5-point support with backs drilled to receive a mid-span shelf support, further reducing deflection. Shelf spans below 27" shall have end 4-point support.
- F. Locks: shall be 5 pin by National lock or approved equal. Provide locks on all casework doors and drawers. Key match locks per room.

2.06 COMPONENT DETAILS AND CONSTRUCTION

- A. Fronts: Door and drawer fronts shall be 3/4" thick. Fronts shall be edged with 3mm radius edge extrusion with face laminate as described 2.01.A. Automated hot melt adhesive application and trimming.
- B. Wall Cabinets: Components shall be 3/4" thick members throughout. Wall cabinet tops and bottoms shall include back groove and minimum four (4) dowel pins per joint for insertion into cabinet ends. Wall cabinet ends shall be 3/4" thick with back groove and precision Computer Numerical Control (CNC) drill pattern for accurate location of fixed members, hardware, and shelf supports. Wall cabinet tops and bottoms to be 1" thick
- C. Mounting Frames: Incorporated in wall units, tall units, and base units, shall be 3/4" thick with minimum two (2) dowel pins per mounting frame end joint for wall and tall units. Base units shall have a minimum of three (3) dowel pins per mounting frame end joint.

SECTION 12400 – PLASTIC LAMINATE CASEWORK

- D. Tall Cabinets: Components shall be 3/4" thick members throughout. Tall cabinet tops and bottoms shall include back groove and up to eight (8) total dowels per end joint (based on cabinet depth). Tall cabinet ends shall be 3/4" thick with back groove and precision CNC drill pattern for accurate location of fixed members, hardware, and shelf supports. Tall cabinets to have two (2) integral (dowel into end) mounting frames. (Designs with simple spacer rails or rails without dowel pin engagement into ends are not acceptable.)
- E. Base Cabinets: Components shall be 3/4" members throughout. Base unit bottoms shall incorporate back groove and up to dowel pins per end joint (based on cabinet depth). Base units shall have a full 3/4" sub top. Cabinets with top frame will not be acceptable
- F. Toe Kicks: Bases shall be separate ladder base design using water resistant exterior grade plywood & concealed fastening. No cabinet sides or body to touch floor. Individual bases constructed of the water-resistant exterior grade plywood will be acceptable.
- G. Cabinet Backs: Shall be in an integrated system of a " prefinished Medium Density Fiberboard (MDF) back captured inside and horizontal grooves. Unit back to be further integrated with attachment to 3/4" doweled-in mounting frames. Fixed backs are mechanically fastened into grooves and sealed with hot melt adhesive. Removable backs shall be set in groove and attached with screws. On cabinets with exposed back a 3/4" High Pressure overlay panel will be used in colors to match exposed casework
- H. Adjustable Shelves: All Shelves shall be 1" thick to match the color of interior of cabinet. If cabinet interior is exposed, then shelves are to be laminated with .028 HPL to match.
- I. Drawers: Four (4) sided full box design with separate attached front shall be provided. Drawer members shall be 1/2" thick for back, sub-front, sides and bottom.

2.07 LAMINATE TOPS

- A. Decorative laminate shall meet NEMA LD3-2005 PF-42 (.042") specification standards. Patterns shall be selected from Wilsonart full range of available options including all "premium" laminates (excluding HD laminates) or approved equal.
- B. Laminate tops shall be 1 1/16" thick with solid moisture resistant particleboard core and laminated with backer sheet edges are to be provided 3mm PVC countertops are to be provided with 4" back and side splash, edged backsplash to match front edge.

2.08 ACRYLIC SOLID SURFACE TOPS

- A. Refer to Specification Section 06651.

SECTION 12400 – PLASTIC LAMINATE CASEWORK

PART 3 EXECUTION

3.01 INSTALLATION

- A. The installer must examine the job site and the conditions under which the work in this section is to be performed and notify the contractor in writing of any unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Casework, countertops, and related materials to be conditioned to average prevailing humidity condition in installation areas prior to start of work.
- C. Install casework and countertops with factory-trained supervision, authorized by manufacturer. Casework shall be installed plumb, level, true, and straight with no distortions (shim as required). Casework shall be securely attached to building structure with anchorage devices of appropriate type, size, and quantity to meet applicable codes, specifications, and safety conditions. Where casework and countertops abut other finished work, scribe and trim to accurate fit, and caulk as required.
- D. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware.
- E. Repair, or remove and replace, defective work as directed upon completion of installation.
- F. Advise project site superintendent of problems and precautions for protection of casework and countertops from damage by other trades until acceptance of the work by the owner.
- G. Cover casework with 4-mil polyethylene film for protection against soiling and deterioration during remainder of construction period.

END OF SECTION

SECTION 15010 – GENERAL REQUIREMENTS.

PART 1 GENERAL

1.01 SCOPE

1. The General, Supplementary, and Special Conditions, applicable portions of all divisions and the addenda thereto, are made a part of this Contract.
2. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole.
3. Where equipment is shown on plans and specified as a single unit in specifications, the equipment quantities shall be per the plans. Provide a complete operating system for all equipment.
4. Where reports and/or requirements are specified herein as a single report, it is the intent that each requirement and/or report be separate for each school, i.e., commissioning report, operation instructions, etc.
5. Specifications for certain equipment or performance may not be applicable for all areas. Refer to the plans for where equipment and/or performance are required.

1.02 CONTRACT DRAWINGS

1. Examine all drawings and specifications. Visit the site to become acquainted with the construction and the extent of the work.
2. In referring to drawings, figured dimensions take precedence over scale measurements. Discrepancies must be referred to the Architect for decision. Each Contractor shall certify and verify all dimensions before ordering material or commencing work.
3. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, shall be furnished as though called for in both.
4. When any device or part of equipment is herein referred to in singular number, such as "the pump", such reference shall be deemed to apply to as many such devices as required to complete the installation.
5. The term "provide" shall mean "furnish and install". Neither term will be used generally in these specifications but will be assumed. The term "furnish" shall mean to obtain and deliver on the job for installation by other trades and/or Contractor.

1.03 CODES AND STANDARDS

1. All work shall comply with all regulations and the latest edition of applicable codes and be subject to inspection and approval of all authorities having jurisdiction.
2. All electrical work shall comply with the latest edition of the NEC National Electrical Code.

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3. Where items indicated on contract documents differ from code requirements, Contractor shall inform Architect prior to installation. Any construction installed by contractor that is not in compliance with applicable codes, shall be removed, modified, and/or replaced at no additional cost to Owner or others.
4. Contractor shall give all notices, obtain and pay for all permits, deposits, and fees necessary.

1.04 SCOPE OF WORK

1. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole system.

1.05 PROGRESS

1. See Specification Sections 01040-Coordination, 01310-Construction Progress and 01315-CPM Schedule.

1.06 SHOP DRAWINGS AND SUBMITTALS

1. See Specification Section 01300 – Submittals.
2. Ductwork and piping shop drawings shall be prepared using 1/4" scale (minimum).
3. The Contractor shall provide a written report stating whether or not any equipment furnished is eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings®). The report is to be submitted with original shop drawing submittal. Report shall include all supporting equipment specification sheets, applicable AHRI Certificate and any other documentation required.

Listed below are the types of qualifying equipment & approved technologies listed by New Jersey SmartStart Buildings® that may qualify incentives which require a report be submitted from each equipment manufacturer for each equipment item submitted. (Note: a negative report MUST be submitted where applicable)

Electric Unitary HVAC

- Unitary HVAC & Split Systems
- Packaged Terminal Systems
- Central DX AC Systems
- Dual Enthalpy Economizer
- Controls
- Occupancy Controlled
- Thermostats
- A/C Economizing Controls

Variable Frequency Drives

- Variable Air Volume Units

SECTION 15010 – GENERAL REQUIREMENTS.

1.07 EQUIPMENT DEVIATIONS

1. The material and products mentioned in these specifications are given to establish a standard of quality, design and performance. The phrases "equivalent", "acceptable", "or approved equal" and "equivalent to" shall be used to indicate that other similar products may be used and provided in accordance with "General Conditions", where applicable, such substitutes are accepted by the Architect as meeting all standards necessary to perform the function intended.
2. Where Contractor proposes to use equipment other than that specified or detailed on drawings, which will require any changes of the structure, partitions, foundations, piping, wiring or any other part of the design documents; all design, engineering and any new coordination drawings and detailing required by other contractors and/or professionals shall be paid by Contractor at no additional cost to Owner.
3. Where such deviations from equipment specified and/or indicated on plans, require a different quantity and/or arrangement of any duct work, piping, electrical work, wiring conduit and/or equipment that would have been required for equipment. Contractor shall with the approval of the Architect provide all material, equipment and labor required by the change at no additional cost to the Owner.
4. Where such approved deviation requires a change to the structure, electrical, plumbing or any other Contractor's or Sub-Contractor's work, or any change to the construction as indicated on the design documents. Contractor shall pay for all costs incurred due to such deviations at no additional cost to the Owner.

1.08 REJECTED MATERIALS

1. See Specification Section 01300-Submittals and the AIA Document A201-2017 General Conditions of the Contract for Construction.

1.09 WORKMANSHIP

1. See Specification Section AIA Document A201-2017 General Conditions of the Contract for Construction.

1.10 WARRANTY

1. See Specification Section 01740 – Warranties and Bonds.
2. At the expiration of the 2-year warranty period; provide an additional factory warranty agreement, to include full coverage, parts and labor, plus emergency service for the all new equipment as specified for an additional 3-year period for a total of 5-year warranty period.
3. Filter Change - See Specification Section 15010 “Filter Changes”.

1.11 MAINTENANCE SERVICE

1. Contractor shall furnish complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for two (2) years from Date of Substantial Completion as determined by Architect.

SECTION 15010 – GENERAL REQUIREMENTS.

2. Provide scheduled maintenance service with three (3) month interval as maximum time period between scheduled service or as indicated elsewhere (applicable only if less than 3-month intervals).
3. Provide 24-hour emergency service on breakdowns and malfunctions.
4. Include maintenance items as outlined in manufacturer's operating and maintenance data.
5. Submit copy of service call work order or report and include description of work performed. Handwritten report acceptable at time of service. Type written report to be provided to Owners' maintenance staff within two (2) weeks of service call.
6. See Section 15930 for additional requirements for control system.

1.12 AS-BUILT DRAWINGS

1. See Specification Section 01700 – Project Closeout

1.13 FIRE RATING

1. All materials used anywhere in the work must have NFPA rating, and be in accordance with ASTM-E-84 as follows:
 - A. Flame Spread - Not Over 25
 - B. Smoke Developed - Not Over 50
 - C. Fuel Contributed - Not Over 25
2. All materials shall be "Self-Extinguishing".

1.14 EQUIPMENT SELECTION AND SERVICEABILITY

1. All equipment shall be located and installed so that it may be serviced. Demonstrate to Owner as part of instructions that there is room to remove all coils, tube bundles, filters, motor and similar equipment. Equipment which is too large or poorly located to permit servicing shall be replaced or repositioned or modifications made to allow for proper servicing at no additional cost to the Owner.
2. Where piping, control diagrams and/or sequencing differ from the recommended piping arrangements of the equipment manufacturer, and will directly affect the equipment performance, the manufacturer's recommendations shall be submitted in writing to the Architect for approval, prior to purchasing the equipment involved and piping arrangement, control, etc., as recommended by manufacturer shall be used. Contractor shall be responsible for obtaining such recommendations from the manufacturers in order to effect correct and proper operation of the equipment at the capacities and temperatures indicated.

1.15 EQUIPMENT FURNISHED BY OTHER TRADES

1. All equipment furnished and/or installed by other trades requiring connections and services by Contractor shall have such services provided by Contractor.

SECTION 15010 – GENERAL REQUIREMENTS.

2. Contractor shall verify exact requirements with approved shop drawings supplied by the equipment contractor and/or supplier prior to construction.
3. Contractor shall verify locations, sizes and requirements of all services to equipment, in field with the equipment contractor prior to construction.

1.16 FACTORY TESTING

1. All factory assembled packaged equipment shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The “Run Test Report” shall be submitted to Owner for approval, prior to acceptance of unit for payment.**
2. All factory assembled packaged equipment shall be fully quality tested by factor run testing under normal operating conditions. Quality control system shall automatically perform via computer; triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria.
3. Detailed report card will ship with each unit displaying status for critical tests and components.
4. If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for east of unit warranty status.

PART 2 PRODUCTS

2.01 ELECTRICAL EQUIPMENT

1. Contractor shall furnish all his equipment complete with motor, controllers, capacitors and starting equipment.
2. Electric motors shall be premium high efficiency (refer to table below for minimum efficiency), open, drip proof induction motors premium high efficiency rated for continuous duty at 15% overload with 40° C. rise; single phase motor shall be capacitor start-induction run. Motors one-half and larger shall be polyphase, motors smaller than one-half horsepower shall be single phase, unless otherwise noted (see Division 16). Starting equipment shall consist of magnetic across-the line starters by Furnas Bulletin 14 or approved equal, unless otherwise specified. Thermal overload type, motor rated manual switches shall be furnished for motors ¾ HP and less which do not require magnetic starters for control purposes.

Premium high efficiency motors shall have efficiencies equivalent to or greater than listed below.

<u>SIZE/HP</u>	<u>1800 RPM ODP NEMA NOMINAL EFFICIENCY</u>	<u>1800 RPM TEFC NEMA NOMINAL EFFICIENCY</u>
1	85.5%	85.5%
1.5	86.5%	86.5%
2	86.5%	86.5%

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3	89.5%	89.5%
5	89.5%	89.5%
7.5	91.0%	91.7%
10	91.7%	91.7%
15	93.0%	92.4%
20	93.0%	93.0%
25	93.6%	93.6%
30 & above	94.1%	93.6%

3. Provide Power Factor correction capacitors size to increase full load power factor to 95%. Capacitors shall be fused, in NEMA enclosure, connected between safety switch and motor starter.
4. Where apparatus is specified as "Packaged", all electrical equipment shall be furnished, set and wired to a single point of connection for apparatus as a unit.
5. Contractor shall set all electrical equipment furnished by Contractor unless same is to be mounted on an electrical panelboard, junction box or similar piece of electrical equipment and is to be wired by others.
6. Where electrical characteristics are not shown, all electrical characteristics shall be as indicated on electrical plans. Where there is a conflict between model numbers which indicate electrical characteristics and electrical drawings, the electrical drawings shall take precedent.
7. Contractor shall verify all electrical characteristics of all equipment with the electrical contractor. Contractor shall submit to Electrical Contractor location of all motors, starters, all other electrical equipment, voltage and phase required prior to submission of Contractor's and/or electrical contractor's shop drawings or start of construction. Contractor shall submit to the electrical contractor all equipment requiring electrical services and obtain the review of the shop drawings for correct electrical characteristics for the electrical contractor prior to submission for review.
8. Should Contractor change type of equipment which results in change to electrical characteristics, then Contractor will be responsible to coordinate these changes with all other trades and pay for all costs required as a result of changes.
9. Should Contractor change electrical characteristics of equipment from that shown on electrical drawings or does not submit shop drawings to the electrical contractor for his review, he is responsible for all cost required, resulting from such change or failure to submit shop drawings.

2.02 ELECTRICAL WIRING

1. Contractor shall furnish and install all electric power wiring required for his contract, with the exception of certain wiring shown under electrical contract. Contractor shall furnish and install all control wiring required for his contract including power wiring to all ATC devices, panels, etc. (unless indicated otherwise on electrical plans).

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2.03 RELIEF VALVES

1. Provide ASME or approved equal labeled relief valve on each closed fluid system, set to relieve full code capacity at design pressure. Pipe discharge to suitable receptor with air gap in accordance with all codes. Do not locate pipe at floor to create a tripping hazard.

2.04 GAUGE GLASSES

1. Jerguson #56 or approved equal cocks with bleed fitting and vertical rising ball check for tubular glass with four guard rods.

2.05 PRESSURE GAUGES

1. All pressure gauges shall be Ashcroft 1020 or approved equal, 4½ size with white dial, black figures and markings. Gauges shall be provided with level handle gauge cock and steam siphon where required.

2.06 THERMOMETERS

1. Thermometers shall be 5" diameter dial type with stainless steel cases and separate wells. Ashcroft T-7173T or approved equal, adjustable to any angle.

2.07 TAGS

1. Contractor shall provide a 2" dia. brass tag with stamped service designation and valve numbers, fastened to each valve with brass chain and "S" hook.
2. Each control, starter, disconnect switch, etc., shall be provided with 3/4" x 2-1/2" metal name tag securely fastened to device. Name tags on controls exposed in finished spaces shall be located on inside of access door or access panel. Provide valve chart and schematic diagram along with floor plan. Both chart and diagram shall be permanently mounted with metal frame and glass front in mechanical room or other area designated by Owner. Contractor may submit an alternative mounting method for Owners' review and approval.

2.08 EQUIPMENT ISOLATION

1. Provide shutoff valves on supply and balancing and shutoff valve on return lines for each piece of equipment including all radiation loops, unit heaters, coils, unit ventilators, air handling units, fan coil units and all pieces of hydronic equipment.
2. At all branch lines serving two or more pieces of equipment, provide a shutoff valve on supply and balancing and shutoff valve on return at the points where the branch line connects to main. Provide drainage and slope pipe to drain points.
3. At all branch lines from mains, whether directly feeding equipment or not, provide shutoff valves on supply and return with ability to drain branch lines.
4. All valves shall be tagged (see tags) and when installed above accessible construction, provide color coded markers (per Architect's direction). Where installed above non-accessible construction, Contractor shall provide access panels. Panels shall be marked for equipment.

SECTION 15010 – GENERAL REQUIREMENTS.

2.09 NEW EQUIPMENT IDENTIFICATION

1. All new HVAC equipment, control panels and starters shall have engraved plastic equipment tags. Tags shall be 1/16" plastic with mounting holes or adhesive backing to allow tags to be permanently mounted to equipment. Indication shall be for the equipment number, usage and location and where applicable circuit numbers and panel for electrical feed served. Equipment number shall be per the contract documents, or where different numbering system is used by the contractor, the number system shall be per as-builts, O & M manuals and/or control drawings. Areas served shall be per room name and number (if applicable) based on architectural plans; contractor to verify prior to submittal. If different room designations and number system is used by Owner/contractor, these shall be used.
2. Size of equipment tags shall be minimum 1"x3". Larger sizes shall be used, 1-1/2" x 4", for equipment requiring additional information.
3. Colors shall be to the extent practical and possible, match duct and pipe marker color.
4. For equipment not ducted or piped, provide same color as adjacent equipment. Engraved plastic equipment tags shall be manufactured by MSI or approved equal.
5. Equipment location tags shall be used for equipment located above acoustic ceiling. Provide white permanent adhesive one inch long by half inch-wide labels on the ceiling grid with color coded laser printed text to identify all above ceiling devise, equipment and valves.

PART 3 EXECUTION

3.01 METHOD OF PROCEDURE

1. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the systems. Where FMCS plenum-rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.
2. Installation, connection and interconnection of all components of these systems shall be complete and made in accordance with the manufacturers' instructions and best trade practices. Contractor shall erect all parts of equipment to be furnished by him under his contract in such time and in such a manner as not to delay or interfere with other contractors' work.
3. Contractor shall lay out his work and be responsible for the establishment of heights, grades, etc., for all interior and exterior piping, equipment, conduit, duct work, etc., included in Contract Documents, in strict accordance with the intent expressed thereby. The establishment of the location of all work shall be performed in consideration of the finished work. In case of conflict, equipment and/or materials shall be relocated without additional cost to the Owner, as directed by the Architect, regardless of which equipment was installed first.
4. Each contractor shall cooperate with other contractors for the proper securing and anchoring of all work included within these specifications. Extraordinary care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other contractors, as each contractor will be held financially responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.

SECTION 15010 – GENERAL REQUIREMENTS.

5. Do not run pipe or conduit for mechanical systems in any concrete slab 3" or less in thickness. Do not place any pipe or conduit in any slab where the outside diameter of the pipe or conduit is more than one-quarter the thickness of the slab.
6. All piping, duct work, conduit and other mechanical materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.
7. All items such as valves, dampers, equipment, controllers, starters, ATC panels, etc., that will be concealed in construction shall be installed and so arranged as to be fully accessible for adjustment, service and maintenance by use of access doors.
8. Where these devices are above suspended ceiling, colored indications mounted on ceiling, markings on suspended ceiling grid, shall be submitted for review and be used to indicate such devices. Color scheme and material used for this shall be coordinated and approved by Owner and reviewed by Architect.

3.02 CLEANING

1. Upon completion of the work, Contractor shall remove all excess material, debris, tools and equipment from the site, and leave the premises in a broom clean condition.
2. Flush out all piping systems with proper solvents to insure removal of all foreign materials. Clean equipment, piping and other surfaces soiled by the work. Remove debris and rubbish on a daily basis.
3. Disposal of all materials shall be Contractors' responsibility. All solvents and other chemicals, and materials used, shall be disposed of in strict accordance with all applicable environmental codes.

3.03 STARTUP AND ADJUSTMENTS

This work is the contractors' responsibility is not part of commissioning and is to be done prior to commissioning.

1. Phasing – The project will have phases for the purpose of this section. This Contractor shall perform startup adjustment.
2. Equipment Startup
 - A. Contractor shall provide all startup. Startup shall be provided by the equipment supplier for all equipment.
 - B. As part of startup, the equipment manufacturer shall provide a complete checklist of all start-up requirements for each piece of equipment. This checklist, when completed, shall be provided to the Architect/Owner indicating that the equipment has been started up, adjusted, balanced, tested and installed in strict accordance with the equipment manufacturer's requirements and is functioning per specification.

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- C. This written confirmation shall be the equipment manufacturers' standard checklist for start-up. All startup, adjustments, replacement of equipment, rebalancing, installation, and any other modification to the equipment or system required to provide the correct and/or specified performance shall be made at no additional cost to Owner. Any of the above items needed shall be indicated as part of this start-up.
- D. All startup provided by the equipment manufacturer shall have written confirmation as specified above and shall be submitted to Owner/architect prior to contractor submission of payment for substantial completion. Failure to provide start-up reports will result in non-payment of billing for substantial completion.
- E. Where any modifications and/or reinstallation is required as specified above and results in additional work to any other contractors or subcontractors work, this work shall be the responsibility of the HVAC contractor and shall be done at no additional cost to Owner/Architect.
- F. Where startup is not completed in a timely manner and results in additional cost to other contractors, regardless of cause, these additional costs will be the responsibility of the contractor. These costs shall result in no additional cost to Owner.
- G. The equipment manufacturer personnel who will do the start-up and provide report shall be a certified factory trained representative whose primary function is starting up of equipment. Qualifications of the start-up representative shall be provided as part of the report or inspection.
- H. As part of startup, the Owner shall be provided operation and maintenance manuals.
- I. As part of startup and/or inspection services after startup has been performed, the same factory trained representative shall be available for a period of classroom instruction to instruct the Owners' personnel the proper maintenance equipment.
- J. Contractor shall supply the Owner with the following literature as furnished by the manufacturer, four weeks prior to startup, and have equipment manufacturers' representative available for any questions.
- Three (3) complete sets of installation drawings.
 - Field wiring diagrams.
 - Installation instructions.
 - Start-up operation and maintenance instructions.
- K. It is the intent of these specifications that the factory start-up personnel have their expertise in the equipment that they are providing start-up service. Where one manufacturer provides more than one type of equipment (i.e., chiller rooftops, etc.), then a factory trained representative for each different type of equipment, if necessary, shall provide startup, inspection report and/or training.
- L. Where startup results in performance which is not in accordance with contract documents or manufacturers' specifications, Contractor shall submit to the architect the discrepancies prior to commissioning of work. Any discrepancies shall be the responsibility of the contractor and be corrected by the Contractor at no additional cost to Owner.

SECTION 15010 – GENERAL REQUIREMENTS.

- M. **All of the work in this section must be completed and accepted by the Owner/Architect as a condition for issuing a substantial completion letter.**
3. Upon completion of initial testing and prior to final balance, Contractor, ATC subcontractor and sheet metal sub-contractor shall perform a survey and testing of the entire system. The testing shall be done with the commissioning agent and/or Owner. Contractor shall include the services of a minimum of three (3) personnel; not to include control personnel and equipment start-up personnel. This report is in addition to and to be completed prior to commissioning. Balance for substantial completion will be withheld until report is completed, reviewed and accepted.
4. Contractor shall perform, but not limited to the following;
- A. Each individual thermostat and/or sensor shall be tested with Owners' representative for proper operation and setpoint. Adjustments shall be made to setpoints, calibration, repairs, and/or replacement of defective equipment.
 - B. Each shutoff valve shall be tested and shall be set for its proper position and tagged per specifications.
 - C. Each balancing valve shall be tested and tagged per specifications (suitable for balancing by commissioning agent).
 - D. Each terminal device not having an electric motor, i.e. baseboard, hot water coil, chilled water coil, etc., shall be tested to determine proper setting operation in accordance with balance specifications and results recorded in balance report.
 - E. Each and every new control device, valve, damper, and controller shall be tested, adjusted, repaired, and/or replaced if found defective. All wiring associated with the control system shall be tested. This shall include control transformers, wiring, electronic devices, and all equipment associated with the control system. (Also see Specification Section 15010, Factory Testing.)
 - F. Each piece of packaged equipment shall be tested with the factory representative present as part of their start-up and shall be tested and operated up to its full capacity. All tests of packaged equipment shall be done before and after equipment has been integrated with the remainder of the system.
 - G. Each fan shall be tested, adjusted, repaired, and/or replaced and made ready for final air balance performed. Fan shall be tested before and after it has been installed and integrated into the remainder of the system.
 - H. The entire automatic control system shall be tested. First, each component shall be tested to determine proper operation, calibration, performance and sequence prior to installation and/or integration into the remainder of the system. After the initial test, the equipment shall be installed and integrated into the system. After this is done, the entire system shall be tested and adjusted for proper sequence of operation, performance, function and capacity of the entire system. This equipment shall be tested from DC computer station and verified for operation in field using 2-way communication.

SECTION 15010 – GENERAL REQUIREMENTS.

- I. When delivered to the job site, all new equipment in need of repair and/or replacement shall not be installed until the necessary repairs have been made. In the event equipment is required to be repaired for whatever reason, it shall be repaired and/or replaced at no additional cost to Owner, and with no interruption of service or extension of contract time and no extension of completion date.
 - J. All piping shall be tested per specification. Include all valves and joints. Any leaks found shall be repaired and damaged construction replaced at no additional cost to Owner.
 - K. All tests, adjustments, repair, and/or replacement of all the mechanical system shall be completed at least three (3) weeks prior to the scheduled date of substantial completion and/or commissioning agent. No extension of time will be given for contractors' failure to perform the above. No extra compensation will be given due to the "overtime" hours implicated on the requirements of this section.
 - L. Upon completion of all tests, Contractor shall prepare a written report for submission to the Architect for his review. This report shall indicate the activity, time performed, results, initial balance points, final balance points, initial and final control settings, repair, and/or remedial work required and performed.
 - M. Contractor shall schedule (submit schedule as part of shop drawing for review) all his work and testing, so that in the event there is replacement, repair, and/or adjustment to system and equipment, it shall be completed, so as not to delay substantial completion.
5. As a result of test, adjustments, and work necessary to perform the above, Contractor shall, at his own expense, remove and replace any construction, either his or of other contractors. It is incumbent upon Contractor to schedule the required work so as to not affect other trades or progress of other contractors' work.

3.04 OPERATING AND MAINTENANCE INSTRUCTIONS

- 1. Contractor shall prepare complete sets of bound operating and maintenance instructions for school; including valve chart framed under glass or laminated with clear plastic mounted on masonite board, indicating number, location and purpose of each valve. Two (2) charts and one (1) mylar copy shall be provided for each mechanical room or as designated. The instructions prepared shall be black on white and shall be complete enough so that men generally familiar with the type of system will need no further data to properly perform the indicated procedures.
- 2. Contractor shall furnish qualified personnel to instruct the Owner's people in the operation of the system and must request from the Owner, in writing, a date for such instruction to begin. Contractor's personnel shall remain until such instruction is complete to Owner's satisfaction. Contractor shall receive from Owner written verification that the Owner's personnel have been thoroughly instructed in the operation, maintenance, and all facets of the system operation.

Where instructions and operation for a particular system cannot be properly done due to system not being able to be operated, i.e., cooling system in winter; Contractor shall obtain from Owner time and date when this instruction will be performed and provide instructions at that time and date when system can be properly operated. This shall be done at no additional cost to Owner and final payment to contractor shall reflect this requirement.

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3. Contractor shall provide to Architect for approval report indicating the itinerary of this instruction complete with duration of instructions location, time, and all other pertinent data.
4. Contractor shall have manufacturers' representatives, as part of their start-up, provide instruction on each piece of equipment. Where offsite instruction, due to complexity of systems, as determined by Architect of record, this shall be provided at no additional cost.
5. Manuals shall include all equipment, equipment parts lists, complete oiling, recommend spare parts, complete coiling, cleaning and servicing data compiled in a clearly indexed and easily understood form. The data shall indicate the serial numbers of each piece of equipment and provide complete lists of replacement parts, motor parts, ratings and actual loads.
6. Provide list of any special emergency operating instructions and a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.
7. Provide a certified log of air quantities at all air supply, return and exhaust openings, ASME and State pressure vessel inspection forms, all motor data, including standard and actual operating in service data and copies of all manufacturer's equipment guarantees and warranties.
8. Provide all ASME and State pressure vessel inspection forms.
9. Provide list of all motor data, including standard and actual operating in service data.
10. Provide all manufacturer's equipment guarantees and warranties.
11. Provide a list of units, filter sizes, quantities and recommended changes. For each piece of equipment, locate filter and demonstrate filter change.

3.05 TRAINING AND INSTRUCTION

1. Provide operating instructions shall include wiring and control diagrams showing the complete lay out of each system. These instruction periods shall be a minimum of hours listed:

Filter Changing	6 Hours
General System	12 Hours

Provide additional training for equipment (see specification sections for hours) as specified in equipment specification sections and control system (see Specification Section 15930). The requirements for these instructions are in addition to the startup requirements for each type of equipment per Specification Section 15010, Part 3.03.

3.06 PAINTING AND FINISHING

1. All painting is to be done in accordance to Rust-Oleum Corporations or approved equal printed instructions. All surfaces to receive two (2) coats of primer, exposed surfaces one (1) finished coat, color selected. Aluminum or galvanized metal surfaces are considered finished where concealed.

SECTION 15010 – GENERAL REQUIREMENTS.

2. All surfaces to be carefully cleaned and/or pickled and filled as required to provide a proper uniform surface. Factory finished equipment shall be touched up or refinished where required.
3. Where equipment is provided as factory painted and is visible on roofs from grade (as determined by construction manager), exposed in space or otherwise not concealed behind finished surfaces, equipment shall be factory painted in accordance with manufacturers standard painting procedures. The color shall be selected by the architect and a color chart shall be submitted for review.
4. All duct exposed and all other exposed equipment, pipe and appurtenances in all other areas unless specifically indicated to be painted by general contractor, to be painted by Contractor color as selected. Submit for approval. All surfaces shall be prepared for painting and/or constructed of materials suitable to be painted.
5. All tags, labels and other removable instructions not required by the manufacturer to remain on equipment shall be removed.
6. Remove all labels and tags on sheet metal for exposed duct and duct above ceiling.

3.07 CONSTRUCTION SAFETY

1. All work shall be done in accordance with the following Federal regulations:
 - A. Williams-Steiger Occupational Safety and Health Standards, Chapter XVII of Title 29, Codes of Federal Regulations.
2. Comply with local Health and Safety Regulations.

3.08 ENERGY CONSERVATION CODES

1. It is the intent of this specification that all equipment and materials furnished meet the latest enforced edition of the International Energy Conservation Code, latest applicable edition, or such code as locally applicable, if more restrictive.

3.09 FLASHINGS

1. All piping passing through roofs shall be provided with Stoneman "Stormtite" or approved equal seamless lead flashing.
2. All ducts penetrating roof shall be provided with curbs, flashing, counter flashing and flashing collar welded to duct. Coordinate exact requirements with roofing contractor or roof bonding agent.

3.10 EQUIPMENT INSTALLATION

1. Rooftop equipment installed within 10' of edge of roof shall have a painted guard, provided by Contractor, at edge of roof, top of guard to be minimum 42" above roof surface, constructed to prevent passage of 2" dia. sphere.

SECTION 15010 – GENERAL REQUIREMENTS.

2. Mounting, details, color, and arrangement of guard shall be submitted for review. Coordinate all details with all other contractors.

3.11 EQUIPMENT LIST

Refer to general conditions. Exclusion of items on list does not relieve Contractor of the responsibility of providing equipment as specified, required to complete work or shown on drawings to be provided by Contractor.

<u>EQUIPMENT</u>	<u>MANUFACTURERS</u>			
	<u>NUMBER 1</u>	<u>NUMBER 2</u>	<u>NUMBER 3</u>	<u>NUMBER 4</u>
AC Unit	Carrier	Johnson	Daikin	Or approved equal
Heating Coils	Carrier	Johnson	Daikin	Or approved equal
Cabinet Unit Heater	Sterling	Rittling	Modine	Or approved equal
Unit Heaters	Sterling	Rittling	Modine	Or approved equal
Exhaust Fans	Cook	Greenheck	Pennvent	Or approved equal
Air Devices	Metal Aire	Tuttle Bailey	Anemostat	Or approved equal
Valves	Mueller	Stockham	Nebco	Or approved equal
Vibration Isolation	Mason Industries	Vibration Mountings		Or approved equal
Insulation	Owens Corning	John Manville	Knauf	Or approved equal
Air Vents	B & G	Sarco	Taco	Or approved equal
Louvers	Air Balance	Penn Vent	Portnoff	Or approved equal
Strainers	Sarco	Mueller		Or approved equal
Hot Water Specialties	TACO	B & G	Thrush	Or approved equal
Ductless Split System	Carrier	Mitsubishi	Daikin	Or approved equal
VAV Air Devices	Carrier	Envirotech		Or approved equal
Boiler	Aerco	Fulton		Or approved equal
Pump	Armstrong	B&G		Or approved equal

3.12 SCHEDULE OF WORK AND COMPLETION DATES

1. The exact times and dates and schedules that the projects will be available for Contractor to do work, shall be as indicated in General Conditions. Refer to general conditions for completion dates.

3.13 DELIVERY AND STORAGE OF EQUIPMENT

1. Contractor shall store, take deliveries and install all equipment in accordance with manufacturers' requirements (see "General Conditions").

3.14 CONSTRUCTION SEQUENCING

1. Refer to General Conditions for the overall contract staging. However, specific items for Contractor should be noted. The following are suggested methods of staging construction. Alternate methods to achieve the intent of these specifications will be allowed; however, they must be coordinated with other trades and submitted for review and approval.
2. The sequence of construction shall be as indicated in the General Conditions of the specifications.

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3. Where work is shown on mechanical plans where it is outside the phase areas indicated or specified in the General Conditions, this work shall be done at any time. All work shall be done so not to interfere with normal school operations. Where work is done outside normal school occupied areas (boiler room, roof area), this work may proceed at Contractor's option. All work, regardless of the location of work, type of work, or extent of work, shall be done with the approval of the School District.
4. Where work in a particular phase requires work to be done outside that phases' construction boundaries, Contractor shall locate all new duct, pipe, and equipment to allow for new construction and/or to integrate with existing building construction.
5. Where ductwork is to be installed in an unconditioned space (due to space not being constructed when duct, pipe, etc., is required to be installed), the pipe and/or duct shall be insulated as specified for outdoors. Where new pipe is required to be installed in an unconditioned space or space which shall be exposed to freezing, the pipe shall be insulated as specified for outdoors and heat traced to prevent freezing (power wiring by Contractor).
6. All new ductwork and piping shall be installed and coordinated with proposed new work.
7. All work required to be modified due to non-compliance with this section, General Conditions or Construction Sequencing, shall be removed, replaced and/or modified at no additional cost to Owner.
8. The permanent ATC system shall be operational for any new construction, regardless of phase. Existing and/or new DDC systems and all wiring shall be installed and protected during construction to facilitate phasing. The use of modular control panels (LSIS, SAC's, etc.) will be allowed as long as the system functions can be monitored and controlled from that location for that phase and be connected to main system upon completion of work. Owner to be instructed on operation (not part of instruction period).

3.15 ALLOWANCE

1. Contractor shall provide as part of his bid a total allowance for items specified in General Conditions and specification.

3.16 FILTER CHANGES

1. Contractor to be responsible for three (3) sets of filters for all new and/or replaced equipment with filters. One set installed on equipment from factory. Install a second set of filters prior to balancing. Install a third set of filters following substantial completion at the start of the 2-year warranty period.
2. These filters are in addition to the filter required for service and filter changes per Section 15010, Part 1.11 – Maintenance Service.
3. Where existing equipment is to remain and be retrofitted, the existing equipment shall have filter changes as specified for new/replacement units.

SECTION 15010 – GENERAL REQUIREMENTS.

3.17 RELOCATION OF EXISTING EQUIPMENT

1. Contractor shall be responsible for removal, storage, relocation and installation of all existing equipment shown or scheduled to be relocated or as may be required to remove existing equipment and/or install new equipment. Contractor will be responsible for capping and reconnection of all existing services presently feeding existing equipment which must be relocated and/or modified and shall patch all adjacent surfaces to match existing.

3.18 PROTECTION OF SERVICES DURING CONSTRUCTION AND DEMOLITION

1. Contractor shall repair, replace, and maintain in service any utilities, facilities or services (in existing areas where new work and/or demolition is to occur) which are damaged, broken, or otherwise rendered inoperative during the course of demolition and/or construction.
2. Contractor shall effectively protect, at his own expense, his work, materials and/or equipment which may cause injury to building personnel during the construction period. All openings must be securely covered, or otherwise protected.
3. Contractor shall be held responsible for all damage so done until his work is fully completed and finally accepted.
4. It shall be the responsibility of Contractor to protect all existing construction and new motors, HVAC equipment, pumps, electrical equipment, plumbing fixtures and all construction during all phases of construction.
5. Where new openings for equipment, duct, etc., are to be provided in one phase and openings provided in another later phase, these openings shall be temporarily secured and make weathertight.

3.19 CUTTING AND PATCHING

1. Where ducts are removed from louvers in exterior wall, the louver shall remain and have insulation between sheet metal. Sheet metal painted (R=8) (caulked) and patched to match existing.
2. Unless otherwise specified and/or Contractor, Contractor shall cut and patch walls, floors, ceilings, roof surfaces and all existing construction for the removal of existing equipment, fixture, piping, controls and other construction for the completion of work under this Contract. All equipment, piping, ductwork, furniture and all construction or materials that are disturbed during construction shall be stored and protected from damage until replaced.
3. Cutting shall be done only after shop drawings have been prepared and with the Architect's approval. Contractor shall exercise proper care and shall not endanger the structure by indiscriminate cutting and shall be responsible for and shall protect all existing construction to remain from damage. Provide and maintain all necessary temporary protective materials, coverings and barricades.
4. Wherever previously unfinished areas are exposed by the removal of existing equipment, these areas shall receive new finishes to blend into the adjoining work.

SECTION 15010 – GENERAL REQUIREMENTS.

5. Wherever existing chases must be enlarged to encase new work, they shall be enlarged to match the existing construction.
6. Wherever fire rated material must be patched, it shall be patched in a manner not to affect its fire rating.
7. All patching work must be done by skilled mechanics in a manner to minimize the patch effect. Wherever new painting is required, it shall be done with at least two coats over new materials.
8. The painting must not only cover the area of the actual patch, but also to the nearest natural break of the newly painted surface. Wherever the surrounding surface to be painted is in poor condition, all loose paint shall be removed before new paint is applied.
9. Patching of existing floor must be done in a manner to assure smooth undersurface and all joints must line up with existing.
10. Wherever new vinyl or rubber bases are to be supplied, they shall match adjoining bases in height and color.
11. Whenever existing ceilings are disturbed, they shall be replaced with new ceiling tiles or patched to match existing and all services, lights, fixtures, etc. supported temporarily and permanently reinstalled.
12. Contractor shall remove and replace all ceilings required for his work with the exception of ceilings shown on architectural plans.

3.20 NEW ROOF OPENINGS IN EXISTING ROOFS

1. Unless otherwise shown on plans, Contractor shall cut all new openings in roof. Structural work by Contractor. Contractor to provide flashing and counterflashing for openings. Contractor shall provide all curbs and equipment. Structural steel must be installed prior to cutting holes.
2. Contractor shall verify opening locations by use of coordination drawing developed by Contractor. Prior to any cutting or construction, Contractor shall physically mark locations for all other prime contractors.
3. Once hole is cut by the general contractor, prior to duct or equipment being set, Contractor shall temporarily protect the opening. After duct and/or curb or equipment is permanently installed and flashed and counter flashed by Contractor, and opening is weatherproofed, it shall be the responsibility of Contractor for any water damage.
4. As part of the coordination, contractors shall provide a schedule agreed to by all parties so that the new openings are permanently closed as soon possible. No opening shall be left temporarily sealed for an extended period of time, as determined by the construction manager.
5. Where new openings for equipment, duct, etc., are to be provided in one phase and openings provided in another later phase, these openings shall be temporarily secured and make weathertight.

SECTION 15010 – GENERAL REQUIREMENTS.

3.21 REMOVAL OF EXISTING EQUIPMENT ON EXISTING ROOF

1. Contractor shall remove existing equipment including all duct, duct supports, pitch pockets, control wiring, electrical wiring (to closet point of termination), all piping and appurtenances. Where removal requires new roofing, this work shall be done by the general contractor.
2. Contractor shall remove existing equipment and provide shop drawings to all contractors for their review. The shop drawings shall include proposed schedule, locations, sizes and other pertinent details. Contractor shall provide a temporary waterproof enclosure. Existing curb shall remain. General contractor to provide permanent cap where curbs are to remain. See architectural and structural plans for details.
3. Where existing curbs are to be removed, these shall be removed by general contractor and Contractor to provide permanent roofing.
4. As part of the coordination, Contractor shall provide a schedule agreed to by both parties so that the existing openings are permanently closed as soon as possible. No opening shall be left temporarily sealed for an extended period of time, as determined by the construction manager.

3.22 REMOVAL

1. Contractor shall remove existing systems as indicated on drawings.
2. Contractor to remove existing systems, pipe, duct, wire, etc., for various phases, and provide either new equipment for future phases and/or patch openings.
3. All equipment, cabinets, ductwork, pipe controls, all pipe insulation (except any asbestos insulation), hangers, electric wiring and all construction and appurtenances shall be removed, to complete all work under this Contract. All work by Contractor.
4. Equipment identified by Owner, prior to removal, that is to be retained by the Owner, which is not to be re-installed, and is to remain the property of the Owner shall be removed undamaged and stored in the building. Location shall be determined by the construction manager at no additional cost to Owner. Contractor shall then load, transport and unload equipment from building to a site designated by Owner within 20-mile radius of site.
5. Removed ductwork, registers, equipment, automatic controls, pneumatic tubing, piping, pipe insulation and electric wiring and all debris shall be removed from the building and site in accordance with general conditions and shall be disposed of in accordance with all applicable environmental rules and regulations. Failure to properly dispose of materials in a proper manner that result in fines, penalties or additional cost are the responsibility of Contractor.
6. All debris in areas occupied by the building personnel during periods of building operation shall be removed daily.
7. Contractor shall patch all wall, floors and ceilings and roof surfaces to match existing adjacent surfaces where obsolete equipment, piping, ductwork, controls and wiring are removed.
8. Work shown on drawings may not indicate all equipment, pipe, etc., nor exact routes, sizes, locations, etc. The drawings are not to be used for estimating detailed take-off for amount of

SECTION 15010 - GENERAL REQUIREMENTS

work required, drawings are for reference only. Contractor shall visit site to determine extent of work and all conditions.

9. Where existing louvers are shown to be removed, Contractor shall remove and provide temporary closure and Contractor to provide permanent construction unless otherwise specifically indicated.

3.23 BUILDING ALTERATION WORK

1. Contractor shall furnish all labor, equipment and materials required to complete alteration work in the building. Unless otherwise indicated on architectural drawings, Contractor shall remove existing construction and replace, to remove existing equipment and/or install new equipment in conjunction with the work.
2. Cut, patch and paint walls, floors, ceilings, roof surfaces and all construction for the installation of equipment, piping and controls.
3. Cut and patch exterior walls for the installation of air intake and exhaust. Finish to match existing adjacent surfaces.
4. Where existing electrical HVAC or plumbing work, due to removal of existing and/or installation of new equipment, is required to be removed. Contractor shall disconnect existing equipment, cap services in a safe manner, remove equipment, store in a location to prevent damage, replace equipment, patch construction to match existing conditions and reconnect equipment to existing services.
5. Contractor shall either retain qualified independent contractors or utilize the other on-site contractors. Contractor shall assume all requirements for any conflicts with union policy and be responsible for same. Contractor shall furnish necessary shop drawings and supervision, in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

3.24 FLUSHING OF EXISTING SYSTEM

1. Refer to Specification Section 15720 for details.

3.25 CONNECTIONS TO EXISTING SYSTEM

1. Where new connections to existing pipes are indicated and/or required for new work, Contractor shall verify exact locations, sizes and conditions prior to doing any work.
2. All new connections shall have new shutoff valves.
3. The existing system shutoff valve locations and conditions shall be verified.
4. The entire piping system shall be drained. Note – To reduce draining main and branch pipe, shutoff valves may be used (to reduce drainage). However, Contractor shall base bid on the entire system being drained and not rely upon existing valves.

SECTION 15010 - GENERAL REQUIREMENTS

5. Where existing valves are found to be not operational, these shall be removed and new connections with new shutoff valves shall be used. Where existing valves serving a zone of pipe, including existing branch lines, is found to be not functioning, these shall be identified and at the time of drainage, be replaced.
6. As part of bid, Contractor shall include replacement of shutoff valves. The type of valves shall be per specification. The average size of 2' dia. shall be used for new valves. Replace insulation, hangers and appurtenances. The cost of new valves shall be for locations where permanent construction (drywall, etc.) is not required to be removed.

END OF SECTION
15010.6362

SECTION 15110 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 MATERIALS AND EQUIPMENT

1. All material and equipment used for this contract shall be unused and of the latest model or design available. Equipment shall be installed in strict accordance with the manufacturer's recommendations and details.
2. Materials not specifically described but indicated or incidentally required shall be acceptable to the Architect and/or Engineer. Submit shop drawings. Materials shall be delivered, stored and handled so as to preclude injury by weather, dirt or abrasion.
3. Contractor shall use only specifically assigned areas for storage of materials and construction operation, unless other areas are authorized by the Owner. Such areas will be identified after the award of Contract by Owner. Comply with local municipal regulations regarding use of and parking on public streets.
4. Contractor shall repair streets, drives, curbs, sidewalks and any existing surface where disturbed by construction operations and leave them in as good condition after completion of the work as before operations started.

1.02 PROTECTION

1. No pipe shall be left open any longer than is required to affix the next piece. If pipe ends are to be left for an extended period, they shall be closed with approved plugs or caps.
2. All equipment shall be covered to protect it from damage; all damage is the responsibility of Contractor.
3. Any pipe, equipment or construction in existing building shall be done in such a manner to prevent injury to building personnel. Particular care must be taken for any work which will be done during buildings' normal operation.

1.03 IDENTIFICATION OF PIPING

1. Use color scheme for painting listed in "Scheme for identification of Piping System", ANSI A-13 and Rust-Oleum Corporation Form # 117 or approved equal. Paint identifying band of color near each valve and fitting, on both sides of pipes passing through wall, and on long pipe runs approximately every 30' (closer when directed), throughout building.
2. All new exposed pipe in any occupied area and all existing exposed pipe insulated and uninsulated, including insulation, hangers, supports and all appurtenances, shall be painted color to match existing. All equipment without factory finished paint shall be painted. All painting shall receive two coats as specified for painting (see Section 15010).
3. Stencil on pipe, near each valve, name of pipe contents in abbreviated form, size of pipe, and arrow indicating direction of flow. Place legend in such location that it can be read from floor. Size of stencil letters shall vary with the size of pipe.
4. Seaton "SETMARK" pipe markers or approved equal are acceptable.

SECTION 15110 - BASIC MATERIALS AND METHODS

5. Due to the changes in direction as shown for various phases, temporarily provide directional arrows where flows will be different under later phases. Provide permanent labels after phasing work is complete.

1.04 TESTING

1. At the completion of all work, and before any covering is applied, all piping except drainage shall be tested hydrostatically at a pressure equivalent to 150% of the working pressure or to material test pressure, if lower. All piping concealed in any manner shall be tested before being concealed. Maximum drop in pressure permissible shall be 2 psi in 24 hours.
2. Testing shall be in accordance with ANSI B31.1 in all test gauges, traps and all other apparatus which may be damaged by the test pressure shall be removed or valved off from the system before tests are made.
3. Where new pipe is shown or required to be connected to existing pipe or equipment, existing and new pipe shall be tested. Tests for new pipe and equipment in existing areas shall be done only after building normal occupied period. All tests shall be done in such a manner as to avoid injury to building personnel and protection of existing construction from damage which may occur due to test or failure of test and/or tested material.
4. In the existing building, all required tests on new and/or existing systems shall only be done after normal school hours. All tests done in the building shall be done in such a manner as to avoid injury to building personnel and damage to existing and/or new construction. Protect all new and existing construction from damage which may occur as a result of the test or failure of test material.
5. All testing shall be done in phases to meet the specification for boiler chiller at East HS per schedule.

1.05 PRESSURE RATINGS

1. All equipment and materials shall have a working pressure as determined by A.S.M.E. (or similar body), of not less than 125 P.S.I.

1.06 SLEEVES

1. All pipes passing through construction shall be fitted with flush sleeves of sufficient diameter to pass the insulation. Sleeves shall be 20 USG galvanized iron, except in masonry, where steel pipe sleeves shall be used. Sleeves in waterproof construction shall be steel pipe, waterproofed with modular mechanical synthetic rubber seals equivalent to "Link Seals" (Thunderline or approved equal). In floors, they shall extend an inch above the floor.
2. In fire divisions, sleeves shall be constructed of fire-retardant material and shall be installed to maintain the fire integrity of the fire division.
3. All materials and construction methods shall be installed in accordance with the manufacturer recommendations and the requirements of the IBC Code or any other applicable code.

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PART 2 PRODUCTS

2.01 PIPE

1. Steel pipe shall be Schedule 40; electric welded, ASTM-A53, Grade A, plain or galvanized as specified under applicable system. . Schedule 80 shall be used for condenser water.
2. Copper tubing shall be hard temper "Type L" except that all piping underground shall be "Type K", conforming to ASTM-B-88.

2.02 PIPE FITTINGS

1. All welded fittings shall be of the same thickness and material as the pipe meeting ASTM-A234. Branch connections shall be made with Weldolets or welding fittings.
2. All flanges shall conform to A.S.A. B-16 using gaskets suitable for the service.
3. Cast iron screwed fittings shall be 125 psi cast iron, ASTM-A-126.
4. Malleable iron fittings shall be 150 psi wsp conforming to ASTM-A-338.
5. Fittings for copper tubing shall be wrought copper of the Solder Type conforming to A.S.A. B16.22.

2.03 BUTTERFLY, BALL, GLOBE AND CHECK VALVES

1. All valves 2" or smaller shall be ball valves and shall be bronze solder end valves in copper tubing and screwed end in other lines. Globe and swing check valves shall be 125 psi WSP, 200 psi WOG with renewable composition disc.
2. All valves 2½" or larger shall be butterfly valves; 125 psi WSP.
3. All valves used for throttling shall be globe type with 500 brinell full plug and removable seat.
4. Non-slam checks shall be used on all pump discharges, elsewhere at Contractor's option.

2.04 PLUG AND BALL VALVES

1. Plug and ball valves shall be 150 psi WOG with full port. Valves used for balancing shall have infinite throttling handle and adjustable stops. All valves bubble tight shut-off.

2.05 UNIONS

1. Unions shall be installed for the removal of equipment.
2. Unions 2" and smaller in copper tubing shall be all brass, ground joint, solder end. In other lines, screw end, malleable iron, 125 psi WSP, 300 psi WOG of the ground type.

SECTION 15110 - BASIC MATERIALS AND METHODS

3. Unions 2½" and larger in copper tubing shall flanged pattern, all brass, solder end. In other lines, 125 psi WPS-175 psi WOG, cast iron flanged pattern, black or galvanized to match piping.

2.06 STRAINERS

1. Strainers to be self-cleaning ("Y" type), cast iron body installed ahead of all control valves and pumps; screens to be Monel or stainless steel with proper perforations for the service, ends to be screwed to 2" size, flanged for sizes 2½" and larger.

2.07 ESCUTCHEON PLATES

1. Where any pipe passes into a finished space, there shall be provided a solid brass, chrome plated, escutcheon plate held to the pipe mechanically or fastened to the building construction.

2.08 ANCHORS

1. Anchors of approved design shall be provided where shown or required for the property control of the stress due to expansion. Anchors shall be heavy metal sections securely fastened to the building construction.

2.09 ANCHOR BOLTS

1. Contractor shall furnish and install anchor bolts as required for the equipment. Anchor bolts shall be DECO's (or approved equal) standard anchor with floating nut, adjustable ½" in any direction. Grout all bases.

2.10 DRIP PANS

1. Provide drip pans of adequate size for all pipes and equipment carrying liquid or liquid vapors where pipes pass over areas or equipment requiring protection. Drip pans shall be constructed of stainless steel, minimum 20-gauge, provide 3" deep pan. Provide drain line to closest sanitary line (minimum 2" dia.).

2.11 ACCESS PANELS

1. Furnish and install access panels not smaller than 18"x18", for access to all concealed valves, automatic dampers, equipment, accessories, etc.
2. Access panels shall be all steel construction with a 16-gauge wall or ceiling frame and a 16-gauge wall or ceiling frame and a 14-gauge panel door with not less than 1/8" insulation secured to inside of door.
3. Doors shall have concealed hinges and cylinder lock except doors for wall panels may be secured with suitable clips and countersunk screws.
4. Access panels shall be flush with finished wall or ceiling and shall be painted to match adjacent surfaces. Access panels behind finished surfaces shall have color coded marking on finished surface to indicate location of doors and type of equipment.

SECTION 15110 - BASIC MATERIALS AND METHODS

5. Access panels in fire rated construction shall be fire rated.

2.12 HANGERS

1. All piping shall be supported by hangers, concrete inserts, and insulation saddles conforming to MSS-SP-58.
2. Hangers for steel pipe and copper tube shall be spaced not over 8' or as required by applicable code.
3. Vertical runs of pipe shall be supported by riser clamps except that pipe 1¼" and smaller may be braced by galvanized malleable iron fasteners. A hanger shall be placed no further than 24" from each change in direction of piping.
4. Hangers for copper tubing shall be copper plated, and completely encircle the tubing. Hangers for insulated pipe shall be outside insulation with sheet metal between insulation and hanger.
5. Hangers shall not be connected to or supported from other pipe, conduits or any other equipment, and shall only be supported directly from building structure.
6. All hangers shall be installed in strict accordance with manufacturers' requirements and good industry standards.
7. Where existing construction is disturbed, removed and/or modified to install new hangers, the existing construction disturbed shall be repaired and/or replaced and finished to match adjacent surfaces.
8. Provide saddles under all pipe, see Section 15180 for specifications. All saddles on exposed pipe shall be painted.
9. Where hangers, support pipe or equipment is exposed in finished spaces, any penetrations of finished surfaces by hanger or supports shall have escutcheons or device to cover opening. All hangers in finished areas shall be painted and done in a neat workmanlike manner. Where hangers or supports may cause injury or are below 8'-0", provide color coded foamed glass finished padding minimum 1½" thick. Padding to be installed so that there are no rough exposed edges. All padding to be installed with fastening devices; no tape allowed.
10. Provide Unistrut or approved equal for mounting of pipe where building structural elements are not adequate.

2.13 CONDENSATE REMOVAL

1. All condensate pipe shall be copper and installed at a minimum of ¾" dia. and a constant slope and uniform alignment. All condensate pipe shall be insulated.
2. All connections to units shall have traps and trap depth equivalent to operating static pressure of unit (i.e., unit with 2" static pressure, minimum depth of water in trap 2").

SECTION 15110 - BASIC MATERIALS AND METHODS

3. All condensate connections to units less than 15 tons shall be EZ Trap Series 100 or approved equal cleanable condensate trap kits, or approved equal, consisting of ¾" dia. trap inlet cross and outlet tee with closure cap. Provide for each five (5) traps installed, one (1) brush (minimum 2 brushes).
4. Condensate pipe shall discharge to leaching wells or as indicated on plans per local codes and/or site conditions.
5. All condensate pipe from rooftop units shall not dump on roof but shall extend to closest roof drain and/or gutter. Where roof drain and/or gutter is greater than 50' from unit discharge, condensate shall discharge to roof with splash block. Splash block to be located where roof pooling, due to drain location, will not occur. Condensate discharging to roof shall be piped to a location where it will drain away from unit or low points on roof.
6. Provide condensate pump where gravity flow is not practical or possible.

2.14 LINTELS

1. The Contractor shall furnish and install all lintels required for the installation and completion of all work of Contractor, provided that the general contractor is advised in advance of such requirements.
2. Failure to give proper notice and/or to comply with the above, requires Contractor involved to be financially liable for all work and material necessary for the completion of work to install lintels. Submit shop drawings of all openings requiring lintels to Contractor.

2.15 AUXILIARY DRAIN PANS

1. Provide auxiliary drain pans under units containing cooling coils where units are located above suspended ceiling or furred space and where there is a blockage of condensate system resulting in overflow which will cause damage.
2. Drain pans shall be constructed of stainless steel, minimum .0276" and minimum 1½" deep, extending 3" beyond unit.
3. For all equipment above finished spaces; provide a water level detector in auxiliary drain pan which shall automatically de-energize unit upon detection of water. Overflow cut-off switch shall be EZ Trap Model EZT-225 or approved equal suitable for vertical and horizontal installation. Contractor shall be responsible for all wiring.
4. On secondary drain lines, provide a water level detector in overflow line which shall automatically de-energize unit upon detection of water. Overflow cut-off switch shall be EZ Trap Model EZT-225 or approved equal suitable for vertical and/or horizontal installation. Contractor shall provide all wiring.
5. Existing equipment being replaced shall have new auxiliary drain pans. The existing systems' duct, pipe and appurtenances shall be modified to allow for new auxiliary drain pans.

SECTION 15110 - BASIC MATERIALS AND METHODS

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

1. Contractor shall do all excavating and backfilling necessary and repair finished surfaces that are disturbed. Contractor shall remove or distribute all earth remaining as directed, and/or provide required backfill. Excavate all substances encountered to the depths and sections shown on drawings.
2. Excavation for pipes, manholes, catch basins, drain inlets, and other accessories shall have 12" clearance on all sides. Areas adjacent to any excavation shall be graded to prevent water running in.
3. Excavation shall not be carried below the required level, and if so carried shall be backfilled with gravel or sand, and tamp to proper compaction.
4. After proper inspection and tests all excavation shall be backfilled with approved material, free from large stones, clumps or frozen earth, wood and other objectionable material. Contractor shall haul away excess material or provide additional fill as required.
5. Backfill for pipes shall be placed evenly and carefully around and over the pipe in six inches minimum layers. Each layer shall be thoroughly and carefully rammed by hand until one-foot cover exists over the pipe. The remainder of the backfill shall then be placed, moistened and compacted to a density equivalent to that of adjacent original materials using mechanical tamping machines.
6. Backfill for shall be placed symmetrically on all sides in one-foot maximum layers and shall be compacted with mechanical or hand tampers to density equivalent to 90% of laboratory density in accordance with ASTM-D698 test.

3.02 INSTALLATION OF PIPING

1. All fittings, offsets, etc., may not be shown. Contractor shall determine their necessity by investigating conditions at the site. Contractor shall use shop drawings for exact locations.
2. All piping above ground shall be run parallel with the lines of the building in the most direct manner, concealed in furred spaces where possible.
3. Pipes shall be cut accurately and placed without springing or forcing all burrs removed.
4. All water piping inside the building shall be properly graded to drain equipped with a ½" hose outlet and angle drain valves.
5. All changes in size of piping shall be made by reducing fittings; no bushing will be permitted unless approved.
6. Contractor shall determine, with approval, where expansion joints, loops or anchors will be required due to space restrictions prohibiting proper runout flexibility.

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7. Valves, air vents, balancing cocks, etc., shall be placed in accessible positions, and flush metal access doors, (18"x18" minimum size), with necessary lintels, etc., provided where they are concealed.
8. All piping shall be located to prevent freezing. Where pipe is located in areas subject to freezing, provide freeze protection and insulation.
9. Contractor shall coordinate all pipe runs with other contractors. Where coordination of Contractors' work requires a modification of his equipment, layout, pipe runs, offsets in pipe, or additional pipe from what is diagrammatically shown on contractor documents, this shall be done at no additional cost to Owner.
10. For all insulated exposed pipe below 8' +/- AFF and in all other locations where pipe damage can occur provide a painted sheet metal jacket 22-gauge with concealed fasteners. (See Section 15180).

3.03 JOINING PIPE

1. Steel piping shall be of welded or flanged construction in sizes 2½" and larger; screwed or welded construction in sizes 2" and smaller. All screwed fittings to be cast iron unless otherwise specified. All threads shall be conformity with A.S.A. B-21.
2. All screwed pipe joints shall be made with Teflon Dry Thread Sealer (3M-#48) or approved equal; applied to male threads only.

3.04 JOINING DISSIMILAR METALS

1. Where copper is jointed to steel, joints shall be made by means of brass or bronze adapter in a cast iron fitting or by means of an electrochemically insulated union. Hangers supporting copper tubing shall be copper or copperized. Copper tubing lines shall not be, even temporarily, supported or secured to ferrous metals.

3.05 FOUNDATIONS

1. Foundations shall be provided by Contractor for all equipment mounted on concrete floors and shall be of concrete construction not less than 6" high unless otherwise shown. Details of all foundations shall be submitted for approval.
2. Foundations or footings for structural steel supports shall be carried to a point not less than 12" below the underside of the floor slab, except where rock is encountered at less depth, then foundation may set on the rock. All foundations shall be built to templates and reinforced as required by the load to be imposed upon them.
3. Existing foundations at Cherry Hill East boiler rooms and five auxiliary boiler rooms shall be removed and slab patched per architectural plans.

3.06 STRUCTURAL STEEL

1. Contractor shall furnish and install all structural steel, supports, braces, hangers, etc., required for his contract unless shown as being furnished and/or supplied by others.

SECTION 15110 - BASIC MATERIALS AND METHODS

2. Structural steel shall conform to "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction, and where applicable, "Code for Welding Building Construction", of the American Welding Society.
3. All structural steel design for support of HVAC system shall be the responsibility of Contractor. The design shall be prepared by a Registered Professional Engineer licensed in New Jersey, whose seal should be affixed to plans.

3.07 PLENUM AREAS

1. Any duct plenum area, ceiling or room plenum shall not contain any combustible material, and all wiring and/or piping shall be suitable and approved by local authorities for plenum installation.

END OF SECTION
15110.6362

SECTION 15180 - INSULATION

PART 1 GENERAL

1.01 SCOPE

1. All surfaces throughout the work shall be insulated with fiberglass insulation as indicated in applicable section.
2. Removal and replacement of existing insulation for new work.
3. All insulation thickness and R Value shall be installed in accordance with ASRAE 90.1, latest edition.

1.02 UNIT PRICES & ALLOWANCES

1. See General Conditions and Specification Section 15010.

PART 2 PRODUCTS

2.01 PIPE INSULATION

1. All piping throughout the work shall be insulated with fiberglass pipe insulation in thickness, indicated in Part 3.04, of high density and with jacket indicated in the applicable section with the exception that outside, or areas exposed to freezing; thickness shall be doubled.
2. All pipe shall be insulated in such a manner as to prevent condensation on all pipe surfaces and appurtenances. All pipe insulation to be tightly butted and sealed to prevent condensation.
3. Vapor barrier jackets shall have self-sealing lap joint, and joints between sections shall be covered with a 4" wide strip to self-sealing vapor barrier materials. Aluminum bands shall be applied, two to a section on all indoor insulation.
4. On outdoor installations, chilled water main pipe at chiller shall be 2-1/2" insulation thickness. Provide 20-gauge stainless steel jacket, stainless steel banded. Note: All hot water heating pipe to be heat traced, see Part 3.04.3.
5. All pipe exposed in finished areas shall be painted color selected. All other pipe exposed in any finished area, where pipe is located below 8'- 6" AFF, insulation shall have stainless steel jacket same as indicated for outdoor pipe, except with no exposed joints or seams.
6. All Refrigerant piping (except hot gas) throughout the work shall be insulated with a 3/4" (nominal wall thicknesses) mold resistant flexible elastomeric, thermal insulation, Insulation must be acceptable for use in air plenums and conform to NFPA 90A and NFPA 90B requirements and meet or exceed ASTM C 534, Type I - Tubular Grade I Standard.
7. All pipe insulation located inside of building shall be plenum rated.

SECTION 15180 - INSULATION

2.02 DUCT INSULATION

1. All supply ducts in unconditioned, including ducts in plenums, shall be insulated with high density fiberglass blanket insulation, UL labeled faced with aluminum foil covered, glass reinforced, flameproof, kraft paper.
 - A. Duct insulation R Values shall be in accordance with 2021 International Energy Conservation Code, Section C403.2.9.

Unconditioned Space – R=6.0 per requirements indicated for the climate zone of the building.

Outside Building – R=8.0 per requirements indicated for the climate zone of the building.
2. All supply and return ductwork in boiler rooms and outside of building insulation envelope shall be insulated as above in 3" thickness (R-8.0).
3. Duct insulation and linings shall not glow, flame or smolder when tested at their rated temperatures in accordance with ASTM-C-411, test temperature 250° F. or greater.
4. Duct coverings shall not penetrate fire resistance rated enclosures or partitions required to be fire rated. Duct insulation at rated enclosure shall have insulating material in accordance with applicable code.
5. For exposed duct in finished locations where external insulation is required, insulation shall be rigid insulation, not blanket. Note – Rigid insulation shall meet all requirements for insulation. All external insulation in finished spaces shall be painted.

2.03 INSULATION AT ROOFTOP UNITS

1. Insulate space between bottom of new and/or replacement rooftop units and deck with insulation.
2. Decking shall be maintained inside the rooftop unit roof curb to a clearance of 1/4" maximum around all duct drops, but never contact the duct.
 - A. Pack all air gaps around duct drops for return and supply with HUSH BATT or approved equal and seal with HUSH SEALAMT HSAC-100 or approved equal.
3. HUSHCORE Model DS-52 or approved equal, In-Curb Composite Acoustical Treatment Performance
 - A. The combination of all layers shall be tested for Sound Transmission Loss in accordance with procedure ASTM E-90-10. The assembly shall be rated at not less than STC-52 with 1/3 octave performance values as listed below for sound radiation thru the deck inside the curb.

Freq. (Hz)	<u>80</u>	<u>100</u>	<u>125</u>	<u>160</u>	<u>200</u>	<u>250</u>	<u>315</u>	<u>400</u>	<u>500</u>	<u>630</u>	<u>800</u>	<u>1K</u>
TL (dB)	26	27	33	32	35	42	45	45	50	56	29	60

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Freq. (Hz)	<u>1250</u>	<u>1600</u>	<u>2000</u>	<u>2500</u>	<u>3150</u>	<u>4000</u>	<u>5000</u>	<u>6300</u>	<u>8000</u>	<u>10000</u>	<u>STC</u>
TL (dB)	62	63	64	65	67	71	74	78	80	80	52

4. The products are manufactured by BRD Noise & Vibration Control, Inc. or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE INSULATION

1. All pipe insulation shall be applied over dry, clean surface with joints tightly butted and jacket firmly and securely attached and smoothed. Insulation shall be continuous through wall, floor or ceiling openings and sleeves.
2. All valve bodies and fittings shall be insulated with preformed fittings of thickness equivalent to adjacent insulation and jacketed with same material. At Contractor's option, except in plenums, outdoors and where not permitted by code; provide precut fiberglass insulation blanket of same insulation thickness as adjacent insulation with a preformed snap on type molded PVC jacket, cover edges with vapor barrier adhesive or vapor barrier tape.
3. Provide metal shields under all hangers or pipe supports on outside of insulation; on roller supports provide pipe shoe cavity with insulation. Insulation inserts shall be heavy duty insulation material length 12" up to 6" dia. pipe 16" long on 8" & 10" pipe & 22" long on 12" pipe and larger. Where insulation cannot support pipe, provide a rigid insulation. Provide vapor barrier. **HANGERS SHALL NOT PENETRATE PIPE INSULATION.** Paint shields on exposed pipe same color as pipe. If pipe is not painted and insulated, paint same color as insulation (white).
4. On outdoor insulation, double insulation thickness, provide stainless steel jacket, and removable stainless-steel jacket at fittings and valves.
5. All pipe connections to equipment shall include all insulation to cover openings to unit unless manufacturer provides method of closure.
6. All pipe insulation to be installed in accordance with insulation manufacturers' requirement to provide moisture tight and thermal performance per specifications and manufacturer's requirements.
7. Hot water pipe in radiation enclosure no insulation.

3.02 INSTALLATION OF DUCT INSULATION

1. Insulation shall be pasted to the duct using "3M" EC-321 or approved equal with joints butted and taped with Scotch No. 47A, or approved equal, flame-resistant vinyl baked tape and dry dust free surface using nylon sealing tool. Tape to be used to seal joints only, NOT TO HOLD INSULATION TO DUCT.
2. In lieu of pasting insulation to duct it may be impaled on 12-gauge mechanical fasteners welded or glued on 12" to 18" centers with minimum of two (2) rows, per side-seal protruding pin with mastic and secure with metal cap.

SECTION 15180 - INSULATION

3. Duct coverings shall not penetrate fire resistance rated enclosures nor partitions required to be fire rated.
4. Insulation shall fit between seams and stiffeners. All joints tightly butted.
5. All duct insulation shall be installed per manufacturers' requirements.

3.03 EQUIPMENT INSULATION

1. All equipment containing fluids whose piping is specified to be insulated or whose surface temperatures will be low enough to cause condensation (60°F.), or high enough to burn persons touching same (110°F.), shall be insulated with a minimum of 1½" thick fiberglass block firmly butted and wired in place, and covered with ½" thick coat of insulating cement troweled over one-inch galvanized hexagonal wire mesh and cement troweled smooth. Metal corners beads shall be applied to protect corners.

3.04 INSULATION THICKNESS

1. Minimum pipe insulation thickness shall be in accordance with the 2021 International Energy Efficiency Code (Latest applicable edition), Table C403.12.3 or local requirements and the following table:

Fluid Design Operating Temp. Range (°F.)	Insulation Conductivity		Nominal Pipe or Tube Size (in.)				
	Conductivity Btu·in./(h·ft²·°F)	Mean Rating Temp. °F	<1	1¼ to <½	1½ to 4	4 to <8	≥8
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60	0.21-0.27	75	1.0	1.0	2.0	2	2
<40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

- A. For piping small than 1½" and located in partitions within conditioned spaces, reduction of these thickness by 1" shall be permitted, but not to a thickness less than 1".
2. Where piping runs outdoors, increase insulation thickness to 2-1/2".
3. Provide heat tape (electric) to prevent freezing of outdoor piping and new/existing outdoor condenser water pipe, domestic water pipe chemical treatment pipe and spray pump assembly and pipe, and all other piping subject to freezing. Electric heat tape to be Chromalox Type M1 cable or approved equal, furnished with all controls, power wiring and appurtenances. Size and capacity per manufacturers' requirements. Provide interface to DDC system for alarm conditions.

END OF SECTION 15180.6362

SECTION 15190 - TESTING AND BALANCING

PART I GENERAL

1.01 SCOPE

1. Provide all labor, materials and miscellaneous items as required to perform all the testing and balancing of ALL air and water system devices and/or systems indicated on plans and/or in the specifications as the mechanical contractor's scope of work.
2. Provide all labor, materials and miscellaneous items as required to perform the testing and balancing of ANY air and water system devices and/or system indicated on plans and/or in the specifications to be provided by TAB contractor.
3. The TAB contractor is to furnish and install all sheaves and pulleys for new and existing HVAC equipment where indicated on plans and/or in the specifications.
4. The TAB contractor shall rebalance 10% of the air and water devices and/or systems after the final balancing report is completed and reviewed by the mechanical engineer. The rebalancing scope shall be as directed by the mechanical engineer's review comments of the final balancing report.

1.02 APPROVALS

1. All work to be done in accordance with the following:
 - A. American National Standards Institute (ANSI): Specification for Sound Level Meters
 - B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): ASHRAE Handbook of Fundamentals latest edition.
 - C. Associated Air Balance Council (AABC): 2002 AABC National Standard for Total System Balance
 - D. National Environmental Balancing Bureau (NEBB): 1998 Procedural Standards for Testing-Balancing Adjusting of Environmental System; 2nd Edition.

1.03 TESTING AND BALANCING

1. Upon completion of the installation and field testing, performance test and adjust all air, water, and/or steam system to provide the air volume and water flow quantities indicated and sound levels required. Accomplish all work in accordance with the agenda and procedures specified by AABC and standards of the NEBB. Correct air and water system performance deficiencies disclosed by the test before balancing the systems.

1.04 AGENCY QUALIFICATIONS

1. Contractor shall obtain the services of a qualified testing organization to perform the testing and balancing work. Prior to commencing work the testing organization shall have been approved by the Architect/Engineer.

SECTION 15190 - TESTING AND BALANCING

2. The criteria for determining qualifications shall be membership in the AABC, or certification by the NEBB, or the testing organization shall have submitted proof to satisfy the Architect/Engineer that the organization meets the technical standards for membership of the AABC.

1.05 AGENDA

1. Review plans and specifications prior to installation of any of the affected system. Submit a written report to the architect indicating any deficiencies in the system.
2. An agenda shall be submitted and approved by the architect prior to start of testing and balancing work. Include the following:
 - A. General description of each system with its associated equipment, and operation cycles.
 - B. A complete listing of all flow and air terminal measurements to be performed.
 - C. Proposed selection points for sound measurements.
 - D. Specific test procedures and parameters for determining specified quantities; e.g. flow drafts, sound levels, etc.
 - E. Samples of forms showing applications of procedures and calculations.

1.06 PROCEDURES, GENERAL

1. Adjust systems and components thereof that perform as required by drawings and specifications.
2. Operating tests of heating and cooling coils, fans and other equipment shall be of not less than 4 hours duration after stabilized operating conditions have been established.
3. Method of application of instrumentation shall be in accordance with the approved agenda.
4. Instruments used for measurements shall be accurate. Calibrate each test instrument by an approved laboratory or by the manufacturer. The engineer has the right to request instrument recalibration, where accuracy of readings is questionable.
5. Comply with manufacturer's certified instructions.
6. Do not install permanently installed equipment for the tests, e.g. gauges, thermometers, etc., until just prior to the tests to avoid damage and changes in calibration.

1.07 PRE-DEMOLITION BALANCE REPORT

1. See Section 15191.

SECTION 15190 - TESTING AND BALANCING

1.08 BALANCE & BALANCE REPORT SCHEDULE

1. The Contractor shall provide the balance report and submit to the Architect/Owner as a shop drawing, which shall be distributed and reviewed in accordance with the general conditions.
2. Any and all work required for balancing of the system shall be done prior to the HVAC contractors' submission of exhaust fan shop drawings.
3. The requirement of this specification is applicable to all phased projects. For phasing, refer to General Conditions.

PART 2 EXECUTION

2.01 AIR SYSTEMS GENERAL REQUIREMENTS

1. All systems shall be balanced to provide air flow rates measured and adjusted to within 7.5% of the design rates. Provide a typed or computer-generated balance report using standard AABC forms, and industry accepted practices for presentation. Where conditions do not allow for system to achieve the specified values, is to be clearly indicated prior to submission of balance report as a separate professionally prepared industry standard form.
2. Review of Documents - It shall be the responsibility of Contractor and balancing contractor to thoroughly review the design drawings prior to submission of shop drawings and indicate where there may be possible problems with accessibility to equipment to allow for proper balancing or where system design will not allow for proper balancing and provide written description of possible problems. The balancing contractor shall review pipe and sheet metal shop drawings and shall provide written confirmation that this has been done. Coordinate with Contractor for locations of all volume control devices. Where volume control devices are required for proper balancing of the system, they shall be provided by Contractor at no additional cost to Owner.
3. Air systems shall be balanced in a manner which shall first minimize throttling losses, then fan speed shall be adjusted to meet design flow conditions.
4. After completion to tests, adjustments and balancing under minimum fresh air conditions, set the system for 100% fresh air. Repeat the total CFM tests as specified above to check field versus design conditions. The results under 100% fresh air cycle shall agree with conditions found under "minimum fresh air operation" before the system is considered to be in balance. Adjustments of the proper dampers shall be made to achieve balance.
5. Contractor shall include as part of his bid, cost to rebalance system after initial and final adjustments based on field conditions, Owners' request or problem areas. For purposes of the bid, the Contractor shall assume a maximum of 10% of all air devices to be rebalanced, to include rebalancing of the fans associated with the air devices.
6. Contractor shall be certified by N.E.B.B. or A.A.B.C.
7. Contractor shall notify Owner or his representative in a timely manner prior to balancing system so that if they elect, they may accompany balancing contractor.

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8. The system shall be commissioned as specified and all balancing shall be done in accordance with time schedule as specified above and in General Conditions.
9. Variable Air Volume Distribution Systems - Where the distribution system utilizes a variable speed or variable air design, all main duct between the fan and controlling devices does not have to be balanced, except where automatic dampers with an air quantity are shown, these shall be set for proper air flow at maximum design conditions. All outlets downstream of the control device (VAV box) shall be balanced.

2.02 AIR SYSTEM PROCEDURES

1. Adjust all air handling systems to provide the required design air quantity to, or through, each component.
2. Adjust equalizing devices to provide uniform velocity across the inlets.
3. Use flow adjusting (volume control) devices to balance air quantities only.
4. Balancing between runs (submains, branch mains, and branches): Use flow regulating devices at, or in, the divided - flow fitting.
5. Final Measurement of Air Quantity: Make final measurements of air quantity, after the air terminal has been adjusted to provide the optimum air patterns of diffusion.
6. Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds.
7. Except as specifically indicated herein, make pitot tube traverses of each duct to measure air flow therein.
8. Pitot tube traverse may be omitted if the duct serves only a single room or space and its design volume is less than 2,000 cfm.
9. Where ducts' design velocity and air quantity are both less than 1000 (fpm/cfm), air quantity may be determined by measurements at terminals served.
10. Test holes shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices.
11. Air Terminal balancing: Measurement of flow rates by means of velocity meters applied to individual terminals shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for balancing agenda.
12. The volume dampers, splitters and deflectors shall be adjusted so that the air velocities and volume will be as specified.
13. A further balance shall be made on temperature basis to maintain uniformity throughout, if so directed.

SECTION 15190 - TESTING AND BALANCING

14. With the fan supply set to handle normal minimum outdoor air, the balancing firm shall perform the following tests and compile the following information.

A. Air Handling Equipment

1. Design Conditions

- a. CFM Supply Air
- b. Static Pressure
- c. Motor HP
- d. Code Required Outside air CFM
- e. Outside air CFM
- f. Fan RPM

2. Installed Equipment

- a. Manufacturer
- b. Size/Model Number
- c. Motor HP, Voltage, Phase, Full Load Amperes

3. Field Test

- a. Fan Speed
- b. No Load Operating Amperes
- c. Fan Motor Operating Amperes
- d. Calculated BHP

4. Test for Total Air

- a. Size of discharge, return air, and outside air ducts.
- b. Number and locations of velocity readings taken and Static Pressure readings taken.
- c. Duct Average Velocity
- d. Total CFM
- e. Outside air CFM
- f. Return air CFM

B. Individual Outlets (diffusers, registers and/or grilles)

1. Identify each outlet or inlet as to location area and fan system, outlet, manufacturer, and type, outlet size, free area, core area, or neck area, required FPM and test velocity and CFM and test results.

2.03 AIR DELIVERY AND NOISE

1. Contractor shall guarantee that all equipment shall operate without objectionable noise or vibration; that all ductwork shall be free from pulsation or objectionable noises; that the volume of air specified will be delivered to all points of supply and exhaust.

SECTION 15190 - TESTING AND BALANCING

2. After this system is in operation, should the ductwork be found to vibrate or chatter, Contractor will be required to eliminate same.

2.04 AIR TIGHTNESS

1. All ductwork shall be airtight per SMACNA leakage standards. All transverse, joints longitudinal seams and duct wall penetrations shall be sealed in accordance with ASHRAE 90.1 1999 and have adhesive (3M EL-750 or approved equal). Pressure sensitive tape shall only be allowed for supply air duct with design pressures less than 2" W.C. in return air plenums.

2.05 WATER SYSTEM PROCEDURES

1. Adjust heating, cooling, and condensing water systems to provide required quantity to, or through each component.
2. Measure water quantities and pressures with calibrate-meters.
3. Use venturi tubes, orifices, or other metering fittings and pressure gauges. Adjust systems to provide the approved pressure drops, prior to the capacity testing. Where flow metering fittings are not installed, measure temperature differential across the heat transfer equipment.
4. Position automatic control valves for full flow through the heat transfer equipment.

5. Pumps

A. Design Data

- GPM
- Head
- RPM
- BHP

B. Installed Equipment

- Manufacturer
- Size
- Type Drive
- Motor HP
- Volts
- Cycles
- Phase
- Full Load Amperes

C. Field Test

- Discharge pressure at full flow and no flow.
- Suction pressure at full flow and no flow.
- Operating head and GPM.

SECTION 15190 - TESTING AND BALANCING

6. All heat transfer equipment heating and cooling elements and primary and secondary takeoffs.

A. Design Data

- MBH specified
 - GPM specified
 - Entering Water Temperature (E.W.T.)
 - Entering Air Temperature (E.A.T.)
 - Water Temperature Drop (W.T.D.)
 - Element type specified
7. Water quantities and capacity shall be measured by temperature taken.

END OF SECTION
15190.6362

SECTION 15191 – PRE-DEMOLITION TESTING AND BALANCING

PART I GENERAL

1.01 SCOPE

1. Contractor shall provide all labor, materials and miscellaneous items as required to perform all the testing and balancing.
2. The balance report shall be submitted to the engineer so that evaluation of report and subsequent changes to the design based on the report can be done within the construction time frame.

1.02 PRE-DEOMOLITION BALANCE REPORT

1. Prior to demolition and/or removal of existing equipment as shown and/or specified to be replaced, provide a pre-demolition balance report for the following.
 - A. Water flows for existing boilers.
 - B. Water flows at all branch main pipes leaving mechanical room.
 - C. Pressure of all supply and return mains leaving mechanical room.
2. The report shall contain all data that will allow Contractor/Engineer to evaluate existing system performance.
3. Based upon the initial inspection and report, the final selection of replacement fans will be determined. Where air quantities are greater than what is indicated on plans, these shall be provided for new fans. New sheaves and drive selections shall be provided.
4. Where the greater air quantities result in a required increase in new fan motor horsepower, these shall be brought to the attention of the Engineer.

1.03 APPROVALS

1. All work to be done in accordance with the following:
 - A. American National Standards Institute (ANSI): Specification for Sound Level Meters
 - B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): ASHRAE Handbook of Fundamentals latest edition.
 - C. Associated Air Balance Council (AABC): 2002 AABC National Standard for Total System Balance.
 - D. National Environmental Balancing Bureau (NEBB): 1998 Procedural Standards for Testing-Balancing Adjusting of Environmental System; 2nd Edition.

1.04 TESTING AND BALANCING

1. Upon completion of the installation and field testing, performance test and adjust all air and/or steam system to provide the air volume and quantities indicated and sound levels

SECTION 15191 – PRE-DEMOLITION TESTING AND BALANCING

required. Accomplish all work in accordance with the agenda and procedures specified by AABC and standards of the NEBB. Correct air system performance deficiencies disclosed by the test before balancing the systems.

1.05 AGENCY QUALIFICATIONS

1. Contractor shall obtain the services of a qualified testing organization to perform the testing and balancing work. Prior to commencing work the testing organization shall have been approved by the Architect/Engineer.
2. The criteria for determining qualifications shall be membership in the AABC, or certification by the NEBB, or the testing organization shall have submitted proof to satisfy the architect/engineer that the organization meets the technical standards for membership of the AABC.

1.06 BALANCE & BALANCE REPORT SCHEDULE

1. The Contractor shall provide the balance report and submit to the Architect/Owner as a shop drawing, which shall be distributed and reviewed in accordance with the general conditions.
2. Any and all work required for balancing the system shall be done prior to the HVAC contractors' submission of exhaust fan shop drawings.
3. The requirements of this specification are applicable to all phased projects.

PART 2 EXECUTION

2.01 AIR SYSTEMS GENERAL REQUIREMENTS

1. Contractor shall be certified by N.E.B.B. or A.A.B.C. per Section 15190.

2.02 WATER SYSTEM PROCEDURES

1. Adjust heating, cooling, and condensing water systems to provide required quantity to, or through each component.
2. Measure water quantities and pressures with calibrate-meters.
3. Use venturi tubes, orifices, or other metering fittings and pressure gauges. Adjust systems to provide the approved pressure drops, prior to the capacity testing. Where flow metering fittings are not installed, measure temperature differential across the heat transfer equipment.
4. Position automatic control valves for full flow through the heat transfer equipment.
5. Pumps
 - A. Design Data
 - GPM
 - Head
 - RPM

SECTION 15191 – PRE-DEMOLITION TESTING AND BALANCING

- BHP

B. Installed Equipment

- Manufacturer
- Size
- Type Drive
- Motor HP
- Volts
- Cycles
- Phase
- Full Load Amperes

C. Field Test

- Discharge pressure at full flow and no flow.
- Suction pressure at full flow and no flow.
- Operating head and GPM.

6. All heat transfer equipment heating and cooling elements and primary and secondary takeoffs.

A. Design Data

- MBH specified
- GPM specified
- Entering Water Temperature (E.W.T.)
- Entering Air Temperature (E.A.T.)
- Water Temperature Drop (W.T.D.)
- Element type specified

7. Water quantities and capacity shall be measured by the temperature taken.

END OF SECTION
15191.6362

SECTION 15630 – BOILERS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install boilers and boiler feed system complete and ready to operate as indicated on plans.
2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for startup. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.

1.02 CONSTRUCTION

1. Boilers shall be rated in accordance with IBR, constructed in accordance with ASME Code for working pressure listed and be UL listed and be so labeled.

PART 2 PRODUCTS

2.01 HIGH EFFICIENCY CONDENSING FIRE TUBE BOILER

1. Furnish and install as shown and specified on plans Aerco Benchmark or approved equal. Each boiler shall be UL Listed; ASME coded and stamped and incorporate gas train designed in accordance with IRI. The boiler manufacturer shall publish known part load value efficiencies. The thermal efficiency shall increase as the firing rate decreases. The boiler control panel shall be proprietary in design and incorporate the functions of temperature control, combustion safeguard control, message annunciation, and fault diagnostic display, on individual field replaceable circuit boards mounted within a single housing. The boiler shall have an ASME approved relief valve.
2. Modulating Air/Fuel Valve and Burner - Boiler modules shall be natural gas fired, condensing fire tube design with a modulating forced draft power burner and positive pressure vent discharge. The boiler burner shall be capable of a 20 to 1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall produce <30 ppm of NOX corrected to 3% excess oxygen. The burner shall be metal fiber mesh covering a stainless-steel body, with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless-steel construction. A modulating air/fuel valve shall meter the air and natural gas input. The modulating motor must be linked to both the gas valve body and air valve body. A variable frequency drive (VFD) controlled cast aluminum pre-mix blower shall be utilized to ensure the optimum pre-mix of air and fuel between the air/fuel valve and the burner.
3. Pressure Vessel / Heat Exchanger - The boiler shall be capable of handling return water temperatures down to 40 F without any failure due to thermal shock of fireside condensation. The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig. The boiler water connections shall be flanged 150 lb. ANSI rated. The pressure vessel shall be constructed of SA53 carbon steel, with a 0.25" thick wall and 0.25" thick upper head. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The heat exchanger shall be constructed of 316L stainless steel fire tubes and tube sheets with a one-pass combustion gas flow design. The fire tubes shall be 5/8" OD with no less than 0.065" wall thickness. The upper and lower stainless steel tubesheet shall be no less than 0.313"

SECTION 15630 – BOILERS

thick. The pressure vessel/heat exchanger shall be welded construction. The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig. Access to the tubesheets and heat exchanger is available by burner and exhaust manifold removal. Minimum access opening shall be no less than 10" dia.

4. Exhaust Manifold - The exhaust manifold shall be of corrosion resistant cast aluminum with an 10" dia. flue connection. The exhaust manifold shall have a gravity drain for the elimination of the condensation with collecting reservoir.
5. Boiler Controls - The boiler control system shall be segregated into three components; control panel, power box, and input/output connection box. The entire system shall be UL recognized. The control panel shall consist of six (6) individual circuit boards utilizing surface-mount technology, in a single enclosure. These circuit boards shall be defined as follows: display board incorporating LED display to read temperature, and a VFD display module for all message annunciations, COU board which houses all control functions, electric low water cutoff board with test and manual reset functions, power supply board, ignition/stepper board incorporating flame safe control, and connector board. Each board shall be individually field replaceable. The combustion safeguard/flame monitoring system shall utilize spark ignition and a rectification type flame sensor. The control panel hardware shall support both RS-232 and RS-485 remote communications. The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight (8) separate status messages and 34 separate fault messages. The "C-More" control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features are called; Setpoint High Limit, Setpoint Low Limit and Failsafe Mode. Setpoint High Limit allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor.

It is a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10-degree selectable band from the desired maximum boiler outlet temperature. Setpoint Low Limit allows for a selectable minimum operating temperature. Failsafe Mode allows the boiler to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode; hence the control can be set to shut off the unit upon loss of external signal if so desired.

The boiler control system shall incorporate the following additional features for enhanced external system interface: system start temperature feature; pump delay timer; auxiliary start delay timer; auxiliary temperature sensor; mA output feature which allows for simple monitoring of either temperature setpoint, outlet temperature, or fire rate; remote interlock circuit; delayed interlock circuit; and fault relay for simple remote fault alarm.

Each boiler shall utilize an electric single seated combination safety shutoff valve/regulator with proof of closure switch in its gas train and incorporate dual over-temperature protection with manual reset in accordance with ASME Section IV and CSD-1.

6. Boiler Management System (BMS) - The boiler manufacturer shall supply as part of the boiler package a completely integrated to control all operation and energy input of the multiple boiler heating plant. The boiler management system shall be comprised of a microprocessor-based control utilizing the MODBUS protocol to communicate with boilers via the RS-485 port. The BMS controller shall have the ability to operate Aerco boilers and existing boiler from the BMS

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panel. The controller shall have the ability to vary the firing rate and energy input of each individual boiler throughout its full modulating range to maximize the condensing capability and thermal efficiency output of the entire heating plant. The BMS shall control the boiler outlet header temperature within $\pm 2^{\circ}\text{F}$. The controller shall be a PID type controller for accurate temperature control with excellent variable load response. The BMS controller shall provide contact closure for auxiliary equipment such as system pumps and combustion air inlet dampers based upon outdoor air temperature. The BMS controller shall have lead/lag ability for three (3) boilers and field adjusted times.

When set on internal setpoint mode, temperature controls setpoint on the BMS shall be fully field adjustable from 50°F . to 190°F . in operation. When set on indoor/outdoor reset mode, the BMS will operate on an adjustable inverse ratio in response to outdoor temperature to control the main header temperature. Reset ratio shall be fully field adjustable from 0.3 to 3.0 in operation. When set on 4ma to 20ma temperature control mode, the BMS will operate the plant to vary header temperature setpoint linearly as an externally applied 4-20ma signal is supplied. When set on MODBUS temperature control mode, the BMS will operate the plant to vary header temperature setpoint as an external communication utilizing the MODBUS open protocol to interface with third party building automation systems.

7. Installation - All aspects of installation of boiler plant shall be in strict accordance with manufacturer's instructions. The vent system shall conform to all manufacturer's recommendations and shall utilize UL listed stainless steel AL-294-C positive pressure. The vent must be sized in accordance with Aerco's recommendations. Boiler plant piping shall be field constructed of materials as specified. Each boiler shall have individually isolating shutoff valves for service and maintenance. Each boiler shall require a minimum gas pressure of 5.5" WC (IPJ gas train) (full load rated capacity).
8. Warranty - The pressure vessel/heat exchanger of the boiler shall carry a non-prorated 7-year warranty against failure due to condensate corrosion, thermal stress, mechanical defects or workmanship. The six (6) individual circuit boards of the "C-More" control panel assembly shall carry a 2-year warranty against failure due to defective materials or workmanship. A warranty certificate must be issued to the Owner from the manufacturer and a copy of warranty must be submitted for engineer's approval. Also, see General Conditions and Section 15010 for 2-year service agreement.
9. Each boiler shall be furnished with U.L. certified combination low temperature limit and high temperature limit controls, rugged guard type combination pressure-temperature-altitude gauges, A.S.M.E. certified side outlet pressure relief valves piped to a floor drain, or if no drain is available, near to floor. The boilers shall be furnished with U.L. listed and certified low water fuel cut-offs and installed according to the manufacturer's instructions and located on the boiler so the burner will become de-energized should the boiler water level fall below the lowest gauge waterline. Provide second redundant manual low water cutoff Honeywell or approved equal. Each boiler shall be protected from over temperature by two (2) high temperature limit controls: one shall be Honeywell L400-6E-1Q0 or approved equal manual reset. Provide lockable switch mounted on each boiler.
10. Provide ducted PVC combustion inlet with sound absorber. Air inlet size, length, layout and sound absorber performance per boiler manufacturer requirements. Provide intake fitting at wall per manufacturers' requirements.

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11. Condensate Neutralizing Tube

- A. The contractor shall supply and install fireside condensate neutralizing tubes for each boiler condensate drain and all flue pipe condensate drains.
- B. The condensate tubes shall be designed to raise the PH level 10-30 times more toward the neutral point of the PH being discharged by the boiler or furnace.
- C. The neutralizer tube or tubes shall be Model JM or approved equal, sized pre-manufacturer and as manufactured by JMM Boiler Works or approved equal.
- D. The installing contractor shall supply all boilers/furnaces and vent condensate drains with P- Traps and unions before the neutralizing tubes.
- E. All piping from boiler to tube shall be PVC and supplied/installed by the contractor. All PVC joints shall be glued in place and all barbed fittings shall be secured with tie wraps.
- F. The boiler and flue condensate drains shall not be combined into one neutralizer. All piping shall be per manufacturer's piping diagrams and directions. All neutralizing tubes shall be secured to the floor or wall, so as not to be exposed to damage or within a normal walkway. The contractor shall fill all "P-Traps" and neutralizing tubes with tap water before the firing of any boiler.
- G. The contractor shall inform the Owner of any maintenance or scheduled recharge of the tubes limestone aggregate as described in the manufacturer's Operation and Installation manual.
- H. Maintenance of tubes shall be for the 2-year maintenance agreement per Section 15010.

12. See General Conditions and Section 15010 for 2-year service agreement.

2.02 EMERGENCY INTERLOCK SYSTEM

1. Furnish as part of the central console, an emergency shutoff interlock system to shut off control power to the boilers when emergency switches at each door entrance are tripped. An emergency switch shall also be provided on the console which shall cut off control power to the boilers.

2.03 WEB INTERFACE AND BUILDING MANAGEMENT SYSTEM INTEGRATION

1. The system shall be capable of connection and interface to the existing DDC control system to support using a standard Web browser connection and interface to the existing DDC control system. It will be the responsibility of the Boiler Manufacturer (and local representative) to coordinate start up and commissioning efforts with the ATC contractor. Interface will be BACnet MSTP or I/P based on direction from ATC Contractor. Any costs associated with startup, commissioning, BACnet integration and unlocking points of the Boiler Management System will be the responsibility of the Boiler manufacturer and mechanical contractor. ATC Contractor assumes responsibility for wiring the loose boiler components, wiring the OA/HWS sensors and wiring BACnet communication cabling to BMS.

SECTION 15630 – BOILERS

PART 3 EXECUTION

3.01 START-UP AND SUPERVISION

1. The combustion management system and boiler as here-in-before described shall be supplied and installed under the continuous supervision of a qualified specialist regularly employed in this capacity by the system manufacturer factory representative. The contractor shall provide in his bid three (3) days (8 hours per day on site) per boiler service time for inspection during construction, start-up time and testing by the manufacturer's service engineer for boilers. Due to safety of operation, only the local factory authorized burner manufacturer shall start up the fuel burner.
2. In addition to the above, start-up shall also be per Section 15010.

3.02 GENERAL

1. Comply with boiler manufacturer's instructions for installation, testing and startup.
2. Provide foundation as recommended by the manufacturer maintaining recommended clearances around and over the equipment.
3. Rig all equipment.
4. Install boiler trim and accessories not installed at factory.
5. Connect water, vents, drains, blowdown piping, and smokepipe to breeching as indicated Ensure that boiler piping is installed per manufacturer's recommendations and all installed piping systems are pressure tested and flushed clean.
6. Flush and clean cast-iron boiler upon completion of installation. The cleaning operation shall be repeated till the condition of boiler water is acceptable to Engineer. Procedure shall be as recommended by Boiler Manufacturer and specifications.
7. Hydrostatically test boiler and piping in accordance with applicable sections of ASME Boiler and Pressure Vessel.
8. Arrange and pay all costs with National Board of Boiler and Pressure Vessel Inspectors for inspection of boiler piping, certification of welding, observation of hydro-static testing, and for certification of completed boiler units.
9. Paint the exposed unpainted metal parts of boiler including the foundation. Clean the metal thoroughly of grease, oil, pipe compound, plaster and other dirt before application of the paint. See Section 15010 for painting and 15110 for color selection.
10. Provide all wiring for control, console, sensors and wiring between boilers to allow for integration of DDC system. All wiring shall be per NEC and in mechanical room be in conduit.

3.03 BOILER BOIL OUT

1. Boilers shall be boiled out with a compound recommended by the boiler manufacturer. The boilers shall be completely drained, flushed and refilled with fresh water.

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2. Closed recirculating systems shall be filled, and sufficient detergent and dispersants are added to remove all dirt, oil and grease. System shall be circulated for at least 48 hours. The automatic make-up valve shall be checked to be sure it is operating.
3. After boil-out is completed, initial water treatment shall be added.
4. All work shall be done under the instruction and supervision of the water treatment contractor.

3.04 TESTING AND ADJUSTMENT

1. Contractor shall furnish all services for adjustments of systems in boilers room. During all tests, it shall be demonstrated that the systems are free from leaks and that all parts of the system will operate carefully. The Contractor shall make final adjustments to all equipment and controls.

3.05 VENTING AND COMBUSTION AIR

1. The Venting and Combustion Air are to be per the Boiler Manufacturer requirements. The exhaust vent shall have a flue connection that meets the Boiler Manufacturer requirements. The exhaust manifold shall have a gravity drain for the elimination of the condensation. Refer to specification 15860 for breeching material and additional details.

3.06 WELDING

1. All welding shall be accomplished by ASME and state certified welders.

3.07 INTERFACE WITH FACILITY MANAGEMENT CONTROL SYSTEM (FMCS)

1. Boiler controller manufacturer to furnish and install an interface to communicate with the Facility Management Control System to provide control and sequence of operation as specified in Section 2.01 1 (above). Contractor shall coordinate the requirements of the FMCS and the Boiler's Controller Manufacturer to assure compatibility.
2. The wiring required between boilers and all control functions (boiler trim) to control panel shall be the responsibility of the ATC contractor. Wiring diagrams shall be provided as part of submission clearly identifying field vs factory wiring.

3.08 EMERGENCY SHUTOFF SWITCHES

1. Provide new emergency shutoff switches and all wiring to control power to boilers at all exits from boiler room (in boiler room).
2. Provide lockable shutoff switch mounted on each boiler.

3.09 GAS VENTS

1. Provide vents from gas train to extend outdoors. All vents shall be extending up above roof.

SECTION 15630 – BOILERS

3.10 EQUIPMENT LAYOUT

1. The layout shown is for the specified boilers. Where the Contractor provides a substitution, the layout for the substituted boilers shall be similar, except for general size, pipe connections, and flue connections. The Contractor shall include any and all modification to and provisions for piping shown and equipment outlet locations and sizes. All work shall be done per Section 15010 and at no additional cost to Owner.

3.11 BOILER MAKEUP

1. Provide check valve in water feed to boiler (in addition to backflow preventor) installed between boiler make-up valve and boiler with shutoff valve. Check valve must be closer to the boiler than the backflow preventer.
2. For clarification, the additional check valve and shutoff valve shall be installed on the existing feed line. Feed line has existing makeup and backflow.

3.12 INSURANCE COMPANY INSPECTOR

1. The Owners' insurance company shall provide a pre-installation checklist of their requirements.
2. The Owners' insuring company's inspection agency shall provide an inspection of the boiler system after construction and provide report indicating compliance with their requirements. Where work is required by insurance inspecting agency and not shown on plans, Contractor to provide cost to Owner.

3.13 CONTROL WIRING

1. The control contractor shall provide all control and power wiring required for the boilers, associated boiler sensors and all work to allow for DDC contractor to connect to boiler control panel.
2. All electrical controls and switches shall be suitable either for 120 volts, 60 Hz or 24 VAC.
3. For control circuits of 115 volts and above, all wire shall be rated for 600 volts and may be either single or multi-conductor cable (refer to section 16000 for acceptable wiring methods).
4. For control circuits below 30 volts, all wire shall be rated for 300 volts and may be either single or multi-conductor cable.
5. All electrical sensing element wire shall be in accordance with the manufacturers' recommendation with the proper number of conductors, equivalent to Beldon No. 8770 or approved equal and installed in "EMT" conduit in mechanical room. This cable shall not be installed in the same conduit with any conductors for voltages of 115 or above.
6. All exposed wiring shall be in EMT or rigid conduit.

3.14 SUPPORTS

1. The general arrangement of the boilers is to allow for installation in very tight conditions and limited floor space.

SECTION 15630 – BOILERS

2. The supports shall consist of a concrete pad for securing the vertical unistrut, base plate fastened to the concrete pad.
3. The vertical unistrut shall be located at rear of unit. Exact vertical location to be based on manufacturers recommended mounting location. Clearance for all horizontal components (flues, intake pipe) shall be maintained.
4. The unistrut shall extend up and be supported from structure. Alternate method of securing top may be used based on existing conditions.
5. The arrangement as shown for the units. Alternate arrangement will be allowed but must be submitted for review. Alternate arrangement, due to existing conditions, shall meet the criteria for clearance, support, etc.

END OF SECTION
15630.6362

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all packaged, self-contained rooftop variable air volume heat recovery air conditioning and heating units.
2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for start up.
3. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.

1.02 APPROVALS

1. Unit shall be rated in accordance with ARI Standards 210/240 or 360 and 270, designed in accordance with UL Standard 1995. Unit shall be designed to conform to ANSI/ASHRAE 15, latest revision. Unit shall be UL tested and certified in accordance with ANSI Z21.47 Standards. Unit casing shall be capable of withstanding Federal test method Standard No. 141 (Method 6061) 500-hour salt spray test and unit shall have marine coating.

1.03 ENERGY EFFICIENCY

1. Units shall have minimum efficiency per ASHRAE 90.1-2007 and be tested in accordance with applicable ARI requirements.

1.04 FILTERS

1. Provide spare filters per Specification Section 15010.
2. Provide 2" thick fiberglass pleated filter with MERV rating of 13 and clogged filter switch installed at factory.
3. Provide 1" aluminum mesh pre- filters mounted over the outside air opening.
4. Provide factory installed electronic pressure differential for 4"-2" filter combination interfaced with DDC system.

1.05 OUTSIDE AIR INTAKES, SCREENS & DAMPERS

1. All outside air intake dampers shall be able to close within 30 seconds after command from system. All outside air intakes shall have hoods with 45° angle openings and have 1.75" square screens.
2. Manufacturer to provide dampers factory mounted. If not factory mounted; equipment manufacturer shall be responsible for purchasing and installing dampers on units. This shall include all interfaces to DDC system, removal and modification to unit.

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

3. The damper and damper operations shall be an integral part of unit and the unit manufacturer shall be responsible for the proper integration and operation of dampers. All damper actuators shall be modulating (2-10vdc and spring return).

1.06 FACTORY TESTING

1. All factory assembled packaged equipment shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The “Run Test Report” shall be submitted to Owner for approval, prior to acceptance of unit for payment.**
2. All factory assembled packaged equipment shall be fully quality tested by factory run testing under normal operating conditions. Quality control system shall automatically perform via computer; triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria.
3. Detailed report card will ship with each unit displaying status for critical tests and components.
4. If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for east of unit warranty status.

PART 2 PRODUCTS

2.01 AIR CONDITIONING UNITS

1. Furnish and install as indicated on plans, factory assembled and wired packaged rooftop mounted air-conditioning units. Units on steel dunnage shall have spring vibration isolation. Where equipment other than specified equipment is used and results in a different roof location and/or a different steel dunnage design, this Contractor to assume all costs (see Section 15010 “EQUIPMENT DEVIATIONS”). Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20 gauge or heavier material.
2. Units shall be completely factory assembled, piped and wired and shipped in one section. Unit shall be factory tested per Specification Section 15010.
3. Paint finish shall be in accordance with ASTM B 117-95 test procedure. Unit exterior shall be color selected by Architect (note: color selection to be from manufacturers' standard and/or custom color chart).
4. Access to filters, blower and heating section, maintenance shall be through hinged access doors with quarter turn handles. Access doors shall have full-length stainless-steel hinges and full perimeter gasketing. Air side service access doors shall have rain break overhangs.
5. All openings through the base pan of the unit shall have upturned flanges of at least 1/2” in height around the opening through the base pan.
6. The interior air side shall be entirely insulated on all exterior panels with 1” thick, 1 1/2 lb. density fiberglass or shaved foam insulation with double wall insulation liners and 304 stainless steel drain pans.

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

7. Supply Fans
 - A. Blowers shall be entirely self-contained on a slide deck for service and removal from the cabinet.
 - B. All belt drive blowers shall have backward inclined blades. Adjustable V-belt drive shall be provided with a minimum rating of 140% of the motor nameplate brake horsepower when the adjustable pulley is at the minimum RPM.
 - C. Blowers drives and motors shall be dynamically balanced. Motors shall be premium high efficiency.
 - D. VFD drive(s) (per Specification Section 15659) shall be factory mounted and wired to the fan motor(s) rooftop controller. Motors for use with a VFD shall be premium efficiency inverter rated only. Motors shall have ball bearings rated for 200,000 hours service and external lubrication connections.
8. Condensers
 - A. Air-Cooled Condenser Section:
 1. The condensing section shall be equipped with vertical discharge axial flow direct drive be premium efficiency fans. Direct drive fans shall be directly connected to and supported by the motor shaft. The condenser coils shall be sloped at least 30° to protect the coils from damage. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes sized for a minimum of 10°F of refrigerant sub-cooling.
 2. Provide hail guards.
 - B. Evaporator Coils
 1. Evaporator coil shall be copper tube with aluminum fins mechanically bonded to the tubes, sine wave rippled with galvanized steel end casings.
 2. Evaporator coil shall have equalizing type vertical tube headers with thermostatic expansion valve.
 3. Evaporator coil shall be furnished with a double sloped drain pan (fabricated of 304 stainless steel) for the positive drainage of condensate.
9. Refrigeration System
 - A. Compressors shall be scroll type with internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators. Compressors shall carry a 5-year non-pro-rated warranty. Each compressor shall be individually staged for capacity control. All units over 7 tons shall be multiple stages and shall have a minimum of 2 stages of capacity control. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the door to the compartment is open and isolated from the base pan and supply air

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

- B. Each refrigerant circuit shall be equipped with thermostatic expansion valve type refrigerant flow control, automatic reset low pressure and manual reset high-pressure refrigerant controls, Schrader type service fittings on both the high pressure and low-pressure sides and refrigerant liquid line driers.
 - C. Unit shall be fully factory charged with R-454.B refrigerant.
 - D. Hot gas bypass shall be provided on all refrigerant circuits (preferred) or 1st compressor of each circuit (acceptable).
 - E. First stage cooling shall be provided with condenser fan cycling to allow operation down to 35°F.
 - F. Compressors shall have vibration isolation.
 - G. Provide refrigeration accumulators to avoid short circuiting.
 - H. Provide acoustical blanket around compressors. Blanket shall be removable with inner and outer chemical resistant Teflon fiberglass cloth high density material and vinyl. Noise reduction in “A” weighting 100-5000H, 29.5 dba per ASTM test procedure E1222-87. Blanket shall be insulate LT450TAST-2” or approved equal; Shannon Enterprises, distributed by BRD or approved equal.
10. Controls
- A. The control system supplied and installed by the manufacturer for rooftop units shall only be controls that provide for safeties and economizer.
 - B. All controls for fan start / stop, cooling staging, heating control, heat recovery enable, dehumidification through hot gas reheat and other control functions shall be connected to a BACnet DDC Controller provided by the unit manufacturer. Manufacturer shall coordinate wiring and control strategies with ATC Contractor. All components necessary for the above strategies shall be wired to a factory terminal strip.
 - C. The DDC contractor shall connect to terminal strip and provide all control programming, functionality and monitoring to achieve the specified sequence of operation.
 - D. All control functions and monitoring required for the unit including all points as specified in Section 15930 to provide the sequence shall be wired to a terminal strip.
 - E. Per the mechanical contractors’ option, the controller may be shipped to the unit manufacturer for installation of the unit.
 - F. Control of supply air flow from duct static pressure control, shall be factory installed variable frequency drive, and supply air duct static pressure sensor with signal from field installed static pressure sensor.
 - G. Unit shall be equipped with hot gas bypass control on the lead refrigeration stage to protect against evaporator frosting at low air flows and suction pressures.

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

- H. For gas heat, a supply air temperature sensor shall be furnished for field installation to control the amount of heating. An electronic controller will also be furnished. The supply air temperature setpoint shall be set thru the terminal strip interface. Safety circuit is by unit manufacturer.
 - I. Controller shall contain LEDs to indicate the power status, communications status, and fault conditions that arise during operation. Fault conditions indicated include supply air sensor failure, outdoor air sensor failure, space sensor failure, mechanical cooling failure, mechanical heating failure, low supply temperature alarm, high supply temperature alarm, control temperature cooling failure, control temperature heating failure, push button override, and zone override.
 - J. Fully modulating economizer with enthalpy limit shall have an outdoor air humidity sensor.
 - K. The unit shall be completely wired to a junction box, be complete with under voltage and overload protection, and so arranged that a single electrical power connection can be made. Temperature control elements shall be brought to a junction box with terminal strip for external connection. Time delay equipment shall be installed by the manufacturer so that no two motors can start together.
11. Economizer cycle shall include return air, relief air and outside air motorized dampers, outdoor and relief hood, and fully modulating control system with enthalpy changeover control and adjustable mixed air thermostat. Economizer control shall be capable of introducing up to 100% outdoor air. The control changeover from mechanical cooling to economizer operation shall be fully automatic through an adjustable enthalpy control device. Provide low leakage dampers, gravity or motorized relief air. Minimum damper leakage shall be per ASHRAE Standard 2010 90.1, Table 6.4.3.4.4.
- Intake – 10 cfm/Sq.Ft. @ 1.0” wg.
- Relief – Non-Motorized; 20 cfm/Sq.Ft. @ 1.0” w.g.
Motorized; 10 cfm/Sq.Ft. @ 1.0” w.g.
- Economizer shall be fully integrated to allow system to operate with economizer and compressors between 75°F. (adj.) and 55°F.

To avoid over pressurization during economizer, outside air shall be limited to 90%.

2.02 BUILDING MANAGEMENT SYSTEM INTERFACE

- 1. Building Management System Interface shall be provided by rooftop unit manufacturer. Note: for simplicity this specification specifies BACnet interface. This Contractor is responsible for all coordination and all cost associated with utilizing LONtalk, BACnet and/or MODbus interfaces. The existing control system is Honeywell Spider BACnet by Core Mechanical.
- 2. Interface control module to be furnished and factory mounted by rooftop unit manufacturer. Through this interface module to allow for all energy management functions (specified in energy management section) to be performed. See Automatic Temperature Control System specifications. The interface module with necessary control and sensors shall all be factory mounted (not field mounted). The only field connection to energy Management System shall be a single communication link.

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

3. All control functions and sequence of operation shall be the responsibility of the DDC contractor, including all wiring, sensors and interfaces.
4. Provide Space Comfort Controller. This profile is communicated via BACnet free topology communications transceiver.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

1. All units shall be supported on roof curbs. The structural steel layout as shown on the plans is for the specified basis of design equipment. Where equipment other than the specified equipment is to be provided, this Contractor (for review and approval) prior to shop drawing submitted shall submit the substituted equipment to the architect, structural engineer and steel contractor. Alternate design will be prepared, and this Contractor shall assume additional cost for design and modifications at no additional cost to Owner.
2. Where specified equipment locations differ due to field conditions from what is shown on plans, this Contractor to provide alternate layout and submit to architect and structural engineer and provide all modifications and additional costs associated with field conditions at no additional cost to Owner.
3. Submit supports and weights to Structural Engineer and/or Steel Fabricator for approval and/or coordination. Relocation of unit based on final layouts shall be the Contractors' responsibility. The contractor shall provide all additional steel for units at no additional cost to Owner.
4. Rooftop unit manufacturer shall provide for each and every unit an additional 8 man-hours on site hours per unit. This shall be in addition to and over and beyond any other specified training or site labor to provide DDC control coordination and installation assistance to DDC subcontractor and Contractor.
5. All unnecessary labels shall be removed. Units shall be painted color selected. Provide color chart for review and approval.
6. All disconnects and electrical devices that are installed externally on the unit by Contractor are to be set at a maximum dimension of 6'-0" above roof deck. Contractor is cautioned that the units are to be installed on sloped curbs which are to match roof slope. Contractor to verify exact slope of roof prior to equipment purchase.
7. Roof curbs shall be vibration isolation curbs and include an insulated panel under compressor section. Provide sound insulating material between roof deck and bottom of unit. Continue roof deck under unit and cut roofing as required for duct and connections. Where roof deck can not be continued, provide sheet metal same or heavier gauge than roof deck. Space between sheet metal and bottom of unit shall be filled with acoustical insulation, see Specification Section 15180.
8. Provide plenum curbs where shown and where required. Curbs shall be insulated, and all duct connections flashed and counter flashed.

SECTION 15653 – VAV ROOFTOP PACKAGED AIR-CONDITIONING UNITS

9. Additional (if any) pressure loss (as a result of specified air flow) of curbs, plenum curbs, adaptacurbs (or approved equal) shall be part of unit internal pressure loss and fan motor selection. Specified external pressure does not include the curbs' pressure loss. Increase fan capacity as required to achieve design external static pressure.

10. Prefabricated structural vibration isolation type steel curbs are to support the supplied equipment loads, plus any applied wind or seismic loads in accordance with the IBC code and 30 PSF roof snow load on top of unit. Curb is to span between the roof framing as indicated on structural plans. Curb shall adjust for slope of pitched roof.

END OF SECTION
15653.6362

SECTION 15656 - DUCTLESS SPLIT SYSTEMS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all ductless split system air-conditioning system.
2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for start up.
3. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.

1.02 APPROVALS

1. Equipment shall be installed, constructed and rated in accordance with all applicable ARI Standards and bear U.L. label.

1.03 ENERGY EFFICIENCY

1. Units 65,000 BTU/hr or less total cooling capacity shall have SEER of 10.0 at standard ratings. Units 65,000 BTU/hr to 135,000 BTU/hr total cooling capacity shall have SEER of 10.3 at standard conditions.

PART 2 PRODUCTS

2.01 OUTDOOR UNITS

1. The unit shall be properly assembled and tested at the factory.
2. Performance - Cooling capacity shall be rated with air entering condenser at 95°F. and a saturated suction temperature at compressor of 40°F. Saturated condensing temperature shall not exceed 117°F.
3. Outdoor coil shall be of nonferrous construction. Coil shall have aluminum plate fins, mechanically bonded to seamless copper tubes. Coil shall be circuited for sub-cooling.
4. Condenser fans and motors - Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation, inherent protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard. Thru-wall units shall have centrifugal fans, horizontal discharge.
5. Compressors - Each shall be of serviceable hermetic design with external spring isolators and shall have an automatically reversible oil pump. Compressor shall be located in a section separated from condenser fans and coil. Multiple compressor units shall be step-start.
6. Controls shall be factory wired and located in a separate enclosure. Safety devices shall consist of high- and low-pressure switches and compressor overload devices. Unit wiring shall incorporate a positive acting timer to prevent short cycling of compressor if power is interrupted. Timer shall prevent compressor from restarting for a five (5) minute period. Provide reduced current starters where required.

SECTION 15656 - DUCTLESS SPLIT SYSTEMS

7. Casing shall make unit full weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be removable to provide access of servicing. Units shall have as access door on the control panel.
8. Connections - Only refrigerant piping and one (1) power supply connection shall be required for each unit.
9. Arrangement - Unit shall be arranged for pad, wall or roof mounting as noted on drawings.

2.02 REFRIGERANT PIPE

1. Split system units are specifically designated as packaged equipment and as such, the manufacturer shall provide a complete design of the interconnecting piping and controls. As part of the submission of equipment, provide a complete refrigerant pipe design to include all pipe lengths, maximum pipe elevations and distances, as well as all other appurtenances. Equipment manufacturer shall be responsible to provide all refrigerant charge. Equipment manufacturer shall review the location and travel distances of refrigerant pipe and point out where there are problems prior to installation. All modifications of the system design shall be the responsibility of the HVAC contractor.
2. Refrigerant pipe shall be type "K" copper located within finished walls or furred-in or concealed in finished areas. All refrigerant pipe shall be properly supported, insulated and installed in accordance with manufacturers requirements.
3. Furnish complete refrigerant piping packaged pre-charged with fillings thermal expansion valve.
4. Furnish and install at each evaporator or liquid connection an externally equalized thermal expansion valve. Valve shall be capable of being serviced with the body flange in line.
5. Provide at each evaporator liquid solenoid valve with moisture resistant coil, manual operating stem and solder or flanged connectors with maximum one psi or less pressure drop at maximum design loading.
6. Insulate all refrigerant pipe per Section 15180.

2.03 INDOOR UNITS (WALL-MOUNTED)

1. General
 - A. The wall-mounted indoor unit section with a slim silhouette and shall have a modulating linear expansion device. The wall mounted indoor unit shall be used with the outdoor unit. The wall mounted indoor unit shall support individual control.
 - B. Each system shall perform in accordance to the ratings shown on plans. Performance shall be based on nominal cooling conditions of 80°F DB, 67°F WB for the indoor unit and 95°F DB for the outdoor unit.

SECTION 15656 - DUCTLESS SPLIT SYSTEMS

2. Indoor Unit
 - A. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
3. Unit Cabinet
 - A. The casing shall have a white finish.
 - B. Multi directional drain and refrigerant piping offering four directions for refrigerant piping and two directions for draining shall be standard.
 - C. There shall be a separate back plate which secures the unit firmly to the wall.
4. Fan
 - A. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
 - B. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - C. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
 - D. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
 - E. The indoor fan shall provide various speeds.
5. Filter
 - A. Return air shall be filtered by means of an easily removable, washable filter.
6. Coil
 - A. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - B. The tubing shall have inner grooves for high efficiency heat exchange.
 - C. All tube joints shall be brazed with phos-copper or silver alloy.
 - D. The coils shall be pressure tested at the factory.
 - E. A condensate pan and drain shall be provided under the coil.

SECTION 15656 - DUCTLESS SPLIT SYSTEMS

F. Both refrigerant lines to the indoor units shall be insulated.

7. Controls

A. Unit shall use controls provided by manufacturer necessary to operate the system and communicate with BMS.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

1. Provide necessary supporting steel and verify weight and mountings with Structural Engineer.
2. Refrigerant pipe shall be type "K" copper and shall be properly supported and insulated per manufacturers requirements. Maximum length, minimum size supports and insulated in accordance with manufacturers' requirements.

3.02 CONDENSATE REMOVAL

1. Provide trapped condensate pipe sloped to proper reception. Condensate is to be drained to storm or sanitary systems as required by local codes. All pipe to be PVC pipe (except in plenums where type "L" copper shall be used). All pipe shall be insulated with 1" thickness fiberglass pipe insulation with ASJ (minimum R = 4.0).

3.03 DDC CONTROL

1. The intent of the design is to provide an open protocol for split system units.
2. The following is a suggested guide for demarcation between equipment and DDC control.
 - A. Items installed by split system unit manufacturer.
 1. Refer to Specification Section 15930, Part 4 for sequence of operation.
 2. Fan motor stop/start
 3. Refrigeration stop/start
 4. Compressor protection via capillary bulb imbedded in the face of the evaporator coil.
 5. Compressor protection controller designed to open the compressor disable circuit based on a coil temperature of 10° (+/-) 5°
 - B. Items supplied, installed, and wired by the contractor and/or DDC sub-contractor:
 1. Zone sensor with set point dial
 2. Zone mounted CO2 sensor
 3. Zone mounted humidity sensor
 4. Exhaust fan interlock
 5. Outdoor Air Humidity Sensor
 6. Controller and all wiring between controller, external points and unit.

END OF SECTION
15656.6362

SECTION 15659 - VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install variable frequency drives to control the speed of all equipment as specified.
2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for startup.
3. Provide all VFD's for pumps, fans, materials, miscellaneous equipment and duct pressure sensors required for the proper functioning of the work.

1.02 APPROVALS

1. Equipment shall meet the standards of CSA, ETL (UL 508), NEMA and NEC.

PART 2 PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

1. Variable frequency drives (VFD) shall be of a Pulse Width Modulated (PWM) design with input displacement power factor of > 0.95 at all operating speeds and loads. They shall be microprocessor based and utilize digital input for parameter adjustments. Use of potentiometer is not acceptable.
2. VFD's shall automatically attempt to restart after a malfunction or an interruption of power. The number of restart attempts shall be user selectable (0 to 5). If restart is not successful, the restart circuit shall lock out and provide contact annunciation.
3. A current limit circuit shall limit motor current to a preset adjustable maximum level. Range of adjustment shall be 50% to 110%. A main logic board shall include a digital display and digital input programming capability. The display shall indicate output speed in RPM, frequency or percent of base speed, motor amps, output motor volts and output load.
4. VFD's shall provide a minimum of four (4) selectable frequency jump points to be used to avoid critical resonance frequencies of the mechanical system.
5. The input signal follower circuit shall have selectable differential inputs and accept an electrical speed command from an external source. A +/- 10V bipolar input shall be standard.
6. Electronic motor protection shall be provided that predicts motor winding temperature from input of specific motor parameters and provides an orderly shutdown should the motor's thermal capabilities be exceeded.
7. Each VFD shall include three (3) open collector outputs to indicate drive run, drive fault and drive ready. It shall also include analog output signals for output load, output speed and motor voltage.

SECTION 15659 - VARIABLE FREQUENCY DRIVES

8. VFD's shall provide up to eight (8) selectable V/Hz profiles. VFD stopping mode functions shall be selectable for either coast-to-stop or stopping at a programmed decel rate.
9. In the event of a loss of signal, VFD shall, by user selection, go to either an adjustable preset speed or to hold speed based on the last reference received and provide a signal to indicate loss of reference.
10. VFD's shall be provided with the following protective features:
 - A. Power circuit shall be fused and isolated internally with respect to ground. Fuses shall be rated minimally at 200,000 A interrupting capacity.
 - B. Power units' logic common shall be at ground potential.
 - C. Phase loss protection shall be provided to prevent single phasing of the VFD input.
 - D. Each VFD shall be capable of continued operation during an intermittent loss of power for 15 ms. Opening a VFD input and/or output line switch while operating shall not damage power system components.
 - E. An instantaneous electric trip circuit shall protect from line-to-line or line-to-ground short circuits. An instantaneous overcurrent trip shall not allow a restart after a trip until reset through the run/stop circuit or unless the auto restart function is operating.
 - F. VFD's shall start into a rotating motor (any speed or direction) and accelerate or decelerate without tripping or component loss.
 - G. All control circuit voltages shall be physically and electrically isolated from power circuit voltages to insure safety to maintenance personnel.
11. Each VFD shall be provided with an alphanumeric diagnostic display with fault indications including: bus overvoltage, bus under-voltage, overcurrent, ground fault, timed overload and drive fault.
12. All printed circuit boards shall utilize quick disconnect plugs and/or pull-apart terminal blocks to facilitate maintenance by providing quick change out without disconnecting terminal strip connections.
13. VFD's shall be capable of starting and operating without a motor connected.
14. All setup and operating parameters shall be stored in non-volatile memory. The static memory module shall be removable so that it can be reinstalled in a replacement logic board with all setup and operating parameters intact requiring no adjustment boards.
15. Provide a softtouch operator panel meeting NEMA 4 and NEMA 12 requirements with the following functions and features:
 - A. Digitally display motor speed, load, amps and output volts.

SECTION 15659 - VARIABLE FREQUENCY DRIVES

- B. Eight (8) LED's for indicating drive run, drive ready, drive fault and operator status/function indications such as auto speed reference and auto restart.
 - C. Selection for Hand-Off-Auto control. In Hand mode the VFD shall be started from the operator's panel. In Auto mode the VFD shall be stopped and started by remote contact closure. In Off mode the VFD is locked out.
 - D. Selection for Manual Ref./Auto Ref. In Manual Ref. mode the VFD speed reference shall be set from the operator's panel. In Auto Ref. mode the VFD speed reference shall be set by the external (duct static pressure sensor) instrument signal.
 - E. Large (½" min.) easily readable displays with mnemonics displayed in English.
 - F. Electric lock-out feature to prevent unauthorized personnel from parameter access.
16. Bypass control circuitry shall be mounted integrally to the VFD enclosure. The bypass shall utilize an input circuit breaker to feed both the VFD and the bypass starter. An input contactor shall be utilized to feed the VFD and isolate the VFD for trouble shooting. An output contactor which is electrically and mechanically interlocked with the bypass starter shall be utilized on the VFD to provide a positive disconnect between the VFD and the motor.

Upon activation of the bypass, there shall be an automatic sequence of the control drives (valves, VAV dampers, etc.) to prevent over pressurization of the system. This shall include, but not limited to, open dampers on VAV's, emergency reheat to prevent overcooling, opening bypasses and open control valves.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

- 1. Install VFD's and duct and/or pipe pressure sensors where indicated on plans or as required to guarantee proper system operation.
- 2. Coordinate with Electrical Contractor to provide adequate access for making required connections between VFD's and air handling and/or pump units.
- 3. Interface with building's automatic temperature control system to provide operating sequence.

END OF SECTION
15659.6362

SECTION 15710 - STEAM SYSTEMS

PART 1 GENERAL

1. Furnish and install boiler blowdown system and all appurtenances.
2. Modifications and removal.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Steam - Black steel pipe.

2.02 PIPING INSULATION

1. Steam - All service jacket.
2. Condensate - All service jacket.

2.03 ACCEPTABLE MANUFACTURERS

1. Basis of Design – Fulton Steam Solutions, Inc. Models:
 - F-150 Blowdown Tank
 - Or approved equal

2.04 BLOW-OFF TANKS CONSTRUCTION

1. The blow-off tank shall be constructed and tested in accordance with ASME Code Section VIII Division 1 of the Boiler and Pressure Vessel Code for a design pressure of 75 PSIG at 400°F and hydrostatically tested to 113 PSIG for standard products.
2. The full capacity of the blow-off tank shall not be less than 64.7 gallons.
3. The dimensions of the blow-off tank shall not be less than (height x diameter): 52"x24" dia.
4. The blow-off tank shall utilize flat heats and shall be constructed of heavy steel and equipped with a baffled steam vent and a 3x4 hand hole for internal inspection of the pressure vessel. The tank shall have a large open vent to prevent pressure from building up in the tank. The unit shall have a primer coat and a finish coat of paint. The pressure vessel shell shall be constructed of AS53B or SA106B pipe or SA516 Grade 70 plate. The heads shall be SA516 Grade 70 plate and the stays shall be SA36 solid round bar.
5. The tank shall be constructed with an internal baffle plate on the blow-off inlet. The cold water inlet allows positive temperature control of the blow-off water to the drain and blow-off tanks shall be fitted with a cooling kit.
6. Provide 6" concrete pad.
7. Provide 4" dia. vent pipe (steel, insulated) for tank up thru existing roof, flash and counter flash. Provide cap on top of opening. Opening 3' +/- above roof.

SECTION 15710 - STEAM SYSTEMS

8. The blow-off tank shall have handholes for inspection, blow-off inlet, blow-off outlet, thermometer, temperature sensor opening (cooling kit), cold water inlet (cooling kit), steam vent, drain and connection for sight glass.

END OF SECTION
15710.6362

SECTION 15720 - WATER CIRCULATING SYSTEMS

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:
 - A. All piping including connections to all equipment and installation of all control devices required for the proper functioning of the work. All insulated valve, materials and specialties necessary for the proper functioning of work. Connections to all equipment requiring connections to this water circulating systems whether furnished under this section or not.
 - B. Connections to, modifications of, and/or removal of existing systems due to new work.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Domestic Water - Copper Tube Type "L".
2. Hot Water Heating - Black Steel Pipe Schedule 40 or Copper Tube Type "L".

2.02 PIPE INSULATION

1. Hot water heating per Section 15180.
2. Condensate pipe per Section 15180.

2.03 AIR CONTROL DEVICES

1. Furnish and install air control devices of type and size shown on drawings or as required for proper system operation.

2.04 BALANCING FITTINGS

1. Furnish and install at the return end of each terminal device, fin tube circuit, unit heaters, coils, heat pumps, etc., a plug valve of same size as run-out.

2.05 AIR VENTS

1. Furnish and install Maid of Mist Automatic air vent, #71 or #74 (150 psi) or approved equal, on all unit heaters and all major drops in piping. Main air vents in equipment room to be Sarco #13W. All air vents shall be installed in such a manner that they are readily accessible for servicing.

2.06 CIRCULATING PUMPS

1. Circulating pump shall be of capacity and type as indicated on plans and be centrifugal pumps specially designed for quiet operation and suitable for service.

SECTION 15720 - WATER CIRCULATING SYSTEMS

2. Pumps shall be equipped with a watertight mechanical seal designed for the service, be non-overloading with impeller size not to exceed 85% of maximum. Provide bypass pipe from discharge to seal faces with adjusting valves. Pumps shall be tested in accordance with Hydraulic Institute. Pump shall be provided with wearing rings. Pump characteristics as shown.
3. Pump manufacturer shall provide start-up service. Pumps shall be provided with strainers, flexible connection, shut-off valve on inlet, check valve, flexible connection and shut-off valve on discharge. The use of combination valve suction strainers shall be allowed, obtain approval prior to use.
4. Insulate all base mounted chilled water pumps (see Section 15181) with removable fiberglass insulation.
5. All base mounted pumps shall have vibration isolation, inertia pads, and pump bases shall be grouted to the base per pump manufacturer requirements.
6. Provide suction diffuser on pump inlet constructed of ductile iron body and cover, integral straightening vanes, stainless steel permanent strainer and disposable start-up strainer. Unit shall have metering port and blow-down port. Pressure loss of strainer shall be based on maximum flow rate per pump design and pump inlet size. Pressure drop shall be based on clean, permanent strainer and not to exceed 1 psi.
7. Provide multipurpose valve on discharge suitable for use as a shutoff, balancing valve, non-slam check valve and flow metering device. Unit shall be constructed of ductile iron seat disc stainless steel. Stainless steel spring, bronze gland and asbestos-free Teflon. Unit shall be rated @ 150 psi WWP @ 200°F. Pressure loss shall be based on maximum flow rate of pump and not to exceed 3 psi with valve fully open.

2.04 INTEGRAL VARIABLE SPEED PUMPS

1. Furnish and install variable speed pump control systems as indicated on plans.
2. The pump control package shall be fully assembled package including DDC system interface with pumps. Pump control package shall be listed by Underwriters Laboratories and bear the UL label.
3. System shall consist of a factory per-packaged and pre-programmed pump, drive, motor and integral control package. Pump logic controller, variable frequency drives, sensors/transmitter's and related equipment shall be installed by the mechanical contractor.
4. The pump logic controller shall operate the system with safeguards against undesirable or damaging conditions.
5. The pump logic controller shall be capable of starting, unloading and stopping pumps based on a system performance program and shall be capable of running four (4) different hydronic optimization sub-routines to optimize a secondary distribution loop allowing two (2) pumps to run as backup and alternate the pumps in a defined flow rate. Traditional external sensing and control platform shall include a sub-routine self-sensing for the automatic balancing of secondary system distribution pumps.

SECTION 15720 - WATER CIRCULATING SYSTEMS

6. The package shall have controller that automates pump balancing and integrate into the Building Automation System (BAS) for all operations and functions of systems.
7. Pump shall have all hardware for DDC integration into existing 3rd-party controls platform for BACnet, LonWorks, Modbus or N2.
8. User interface screen shall have dynamic graphical display of system pump performance point system performance curb. Graphical display of pump performance range. Dynamic graphical cost and energy comparison.

PART 3 EXECUTION

3.01 SYSTEM BOIL OUT

1. Existing hot water heating system that has been disturbed is to be filled and sufficient detergent and dispersant added to remove all dirt, oil and grease. System shall be circulated for at least forty-eight (48) hours. The automatic make-up valve shall be checked to be sure it is operating. The system shall have strainer baskets cleaned and replaced after each cleaning. The existing system shall be completely flushed a minimum of three times. This work shall be done in the presence of the construction manager and be done prior to commissioning.
2. After boil is out completed, initial water treatment shall be added.
3. All work shall be done under the instruction and supervision of a reputable local water treatment contractor; which firm shall be submitted for approval.
4. Where new pipe is shown to be connected to existing pipe, the new pipe shall be cleaned and tested as specified below. All cleaning shall be done with valves at connection to existing system closed. Provide method to fill and drain system.
5. This Contractor shall be responsible for furnishing and installing additional chemicals due to increased amount of water in system due to new pipe and equipment.
6. Contractor is cautioned that new boilers require boil out. Boil-out for boilers may differ from pipe chemicals. Refer to boiler manufacturers' requirements. Valve off remainder of system from boiler.

3.02 BALANCING

1. For balancing, see Specification Section 15190, and for pre-demolition balancing, see Specification Section 15191.

3.03 TESTS WATER PIPING

1. All piping shall be hydraulically tested for a period of four (4) hours to the following pressure or 1½ times working pressure; before insulation is installed, minimum 150 psi for chilled and hot water heating systems.

SECTION 15720 - WATER CIRCULATING SYSTEMS

2. During the period of tests, all welds, joints, etc., shall be coated with a soap emulsion to test for leaks. Any leaks that are disclosed by the test shall be made tight and all joints left free of all imperfections. The four-hour test period shall continue after any imperfections have been perfected. All piping in chases or concealed shall be tested before they are covered.

3.04 FEED WATER

1. Feed water connection shall be made to each water system through 3/4" #12 Bell and Gossett regulator valve, or approved equal, 3-valve by-pass and strainer. Provide reduced pressure backflow preventer with indirect waste to drain. Provide additional check and shutoff valves between fill valve assembly and boiler. Provide water meter.

3.05 SYSTEM BOIL OUT

1. Condensing Boilers are to use a chemical cleaning agent approved by the Boiler Manufacturer and following the manufacturer's guidelines and procedures. After which the boilers shall be completely drained, flushed and refilled with fresh water.
2. Existing hot water heating system that has been disturbed is to be filled and sufficient detergent and dispersant added to remove all dirt, oil and grease. System shall be circulated for at least forty-eight (48) hours. The automatic make-up valve shall be checked to be sure it is operating. The system shall have strainer baskets cleaned and replaced after each cleaning. The existing system shall be completely flushed a minimum of three times. This work shall be done in the presence of the construction manager and be done prior to commissioning.
3. After boil is out completed, initial water treatment shall be added.
4. All work shall be done under the instruction and supervision of a reputable local water treatment contractor; which firm shall be submitted for approval.
5. Where new pipe is shown to be connected to existing pipe, the new pipe shall be cleaned and tested as specified below. All cleaning shall be done with valves at connection to existing system closed. Provide method to fill and drain system.
6. The Contractor shall be responsible for furnishing and installing additional chemicals due to increased amount of water in system due to new pipe and equipment.
7. New boilers and existing boiler shall be done separately to allow for different cleaning agents to be used.

3.06 BALANCING

1. For balancing, see Specification Sections 15190 and for pre-demolition balancing see Specification Section 15191.

3.07 TESTS WATER PIPING

1. All piping shall be hydraulically tested for a period of four (4) hours to the following pressure or 1½ times working pressure; before insulation is installed, minimum 150 psi for chilled and hot water heating systems.

SECTION 15720 - WATER CIRCULATING SYSTEMS

2. During the period of tests, all welds, joints, etc., shall be coated with a soap emulsion to test for leaks. Any leaks that are disclosed by the test shall be made tight and all joints left free of all imperfections. The four-hour test period shall continue after any imperfections have been perfected. All piping in chases or concealed shall be tested before they are covered.

3.08 CHEMICAL TREATMENT

1. Furnish all necessary labor, chemicals, feeding equipment power, piping control, wiring and appurtenances required for proper system operation to maintain following conditions;

<u>System</u>	<u>Months of Operation</u>
---------------	----------------------------

Hot Water Heating	9
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Service shall be provided for a period of 2 years as part of service warranty.

2. Provide analysis of available water supply for the following:
 - A. ph
 - B. Total Alkalinity
 - C. Chlorides
 - D. Hardness
 - E. Total Dissolved Solids

3. Maintain the following conditions in each system:

HOT WATER

ph	7.0 TO 10.0
Inhibitor for Scale and Corrosion	-
Cycles*	-
Organic Growths	-
Buffered Nitrate	-
Molybdate	100 TO 150 PPM

* Actual number to be determined from analysis of make-up water.

SECTION 15720 - WATER CIRCULATING SYSTEMS

4. Provide chemical feeding equipment:
 - A. Closed recirculating systems - Steel bypass feeder installed across circulating pump suction and discharge lines, with tank and piping insulated using the same thickness and type of insulating as provided for the piping system.

END OF SECTION
15720.6362

SECTION 15760 - TERMINAL UNITS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all terminal units. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for start up. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.
2. Removal of existing equipment and appurtenances.

1.02 CERTIFICATION

1. All fans shall have AMCA Certified ratings. All radiation shall be IBR rated. All equipment, where applicable, shall bear UL label.

PART 2 PRODUCTS

2.01 HEAT TRANSFER COILS

1. Heating and cooling coils shall have tubes with aluminum fins securely bonded to the tubes to form a tight metal to metal contact. Coil header may be steel, copper cast iron. Tubes shall be staggered in the direction of air flow.
2. Casings shall be galvanized sheet steel with intermediate tube supports for coils exceeding 48" tube length. Headers shall be hydrostatically tested at 400 psi pressure before assembly, maintaining test pressure for two (2) hours without addition of pressurizing fluid. After assembly, each coil shall be tested at 250 psi air pressure, with coil submerged in water for at least fifteen (15) minutes. Unless otherwise noted, supply and return connections shall be on the same end of coil.
3. All water coils shall have drain and vent tappings. Cooling coils shall be pitches in direction of drainage.

2.02 CABINET UNIT HEATERS

1. Units shall be of manufacturer size, quantity and capacity as indicated on plans.
2. Cabinet type models shall have 16-gauge steel cabinets, except horizontal cabinet type which shall be of 18-gauge steel. Integral stamped inlet and outlet grilles shall have 15-degree downward deflection. Cabinets shall have heavy density glass fiber insulation and surfaces shall be phosphatized and painted with baked enamel; colors selected by Architect.
3. Vertical recessed and semi-recessed models shall have 16-gauge front panels attached directly to the basic unit.
4. All coils shall have aluminum plate-type fins mechanically bonded to the copper tubes suitable for working pressures up to 300 psig. Supply and return connections to be on same side of units.

SECTION 15760 - TERMINAL UNITS

5. Fans shall be direct driven, forward curved, centrifugal double width type. Motors shall be the permanent split capacitor type and have three (3) speeds. Filters shall be the Scott Foam type.
6. Verify wall thickness in field prior to installation or ordering, adjust mounting.
7. Provide wall mounted remote thermostat and all interconnecting services. Provide interface with central control system where applicable and where required to be deenergized during summer dehumidification. Provide wall mounted thermostat. Provide aquastat to prevent water flow below 140 degrees F.

2.03 FINNED TUBE RADIATION

1. Enclosures shall be fabricated from 16-gauge zinc coated steel with baked enamel finish, color as selected by Architect. Enclosure shall be wall to wall with continuous modulating damper and access panel. Provide enclosure suitable for installation and access of control valves (where applicable).
2. Venetian type louvered outlet grilles shall be provided where indicated with pencil proof air discharge slots. Bottom and top of enclosure skirt shall have double break for lateral stiffness.
3. Furnish required bracket hanger assemblies with heavy flag brace for rigid front sheet and element support, and 20-gauge full back panel.
4. Provide all required accessories for a complete installation.
5. Enclosure shall be of dimensions, size as indicated. Element/enclosure combined capacity shall be as indicated. All covers components shall be furnished in baked enamel finish as directed by Architect. Enclosure shall be installed wall to wall with all necessary accessories, including column enclosures, end caps and joint trim etc. Radiation shall be size and capacity indicated.
6. Mount radiation 4" above finished floor unless otherwise indicated or recommended by manufacturer.
7. Install with shutoff valve on inlet and balancing valve on discharge with unions and drain valve.
8. Pedestal mounted radiation shall have supports painted (color selected).
9. Where control valves are installed in radiation, provide enclosure same construction as radiation.

2.04 UNIT HEATERS

1. Unit Heaters shall consist of fan, factory finished baked enamel casings, and non-ferrous metal coils with fins mechanically bonded to tubes. Fan motors to be totally enclosed, designed for continuous operation. Unpainted ferrous parts to be cadmium plated.

SECTION 15760 - TERMINAL UNITS

2. Horizontal unit heater shall be furnished with double deflection louvers. Vertical unit heaters shall be furnished with adjustable diffusers. Provide fan guards where blades would otherwise be exposed.
3. Cabinet unit heaters shall be furnished with multiple centrifugal fans and be recessed mounted unless otherwise approved.
4. Units to be of manufacturer types, capacities and quantity shown on drawings.
5. Interface with central control system. Provide wall mounted thermostat.

PART 3 EXECUTION

1. Provide vibration isolation and all hanging materials required prior to hanging of any unit, verify supports.
2. Provide a control system for equipment in accordance with ATC Section to provide all functions as specified in ATC Section. The control system supplied and installed by the equipment manufacturer for unit ventilators shall only be controls that provide for compressor and equipment safeties. All controls for fan start/stop/status, cooling staging, heating control, dehumidifications and other control functions shall be connected to the BAS controller. Manufacturer shall coordinate wiring and control sequences with the BAS/ATC contractor.
3. Where new piping is exposed in finished area, or where required for new piping and/or as indicated on plans, provide 16-gauge vertical sheet metal enclosure. Enclosure to be manufactured by the radiation manufacturer and match cabinet construction and color (factory painted). Verify all dimensions and conditions in field. Enclosure shall be installed so there are not exposed unfinished surfaces. See architectural plans for details. All fasteners shall not be visible.
4. Provide for each hot water heating coil, unions to facilitate removal of coil and control valve, automatic air vent, drain valve, shutoff valve, balancing valve, temperature gauges on supply and return and pressure gauges on supply and return.
5. For all cabinet unit heaters, unit heaters and radiant heaters provide aquastat to prevent operation of water temperatures less than 140 degrees F.

END OF SECTION
15760.6362

SECTION 15810 - AIR HANDLING EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all fans and air handling units. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for startup. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper function of the work.

1.02 CERTIFICATION

1. All fans shall have AMCA Certified ratings for sound and performance and bear UL label and manufacturer be 150 9001 certified facility.

1.03 ENERGY EFFICIENCY

1. All motors shall be premium high efficiency type.

1.04 BALANCING

1. Balance all equipment per manufacturers' requirements and Section 15190.

1.05 FACTORY TESTING

1. All factory assembled air handling units shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The "Run Test Report" shall be submitted to Owner for approval, prior to acceptance of unit for payment.**
2. All factory assembled packaged equipment shall be fully quality tested by factor run testing under normal operating conditions. Quality control system shall automatically perform via computer; triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria.
3. Detailed report card will ship with each unit displaying status for critical tests and components.
4. If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for east of unit warranty status.

PART 2 PRODUCTS

2.01 FANS

1. All fans to be manufacturer type, size, quantity and capacity shown on drawings. All rooftop fans shall have self-flashing Unibeam roof curbs and disconnect switch. All fan motors shall be premium high efficiency. All fans shall have backdraft damper.
2. Ceiling exhaust fans shall have acoustically insulated housings, maximum sound level rating of 4.6. AMCA Sones terminal box with cord, plug and receptacle inside the housing. Entire fan, motor and wheel assembly shall be removable from the housing. Motor speeds shall not exceed

SECTION 15810 - AIR HANDLING EQUIPMENT

1,500 RPM and all fan motors shall be suitably grounded and mounted on rubber-in-shear vibration isolators. Provide insulation on all discharge duct where required to prevent condensation. Units shall have metal face grille. Provide reinforced aluminum backdraft damper with continuous aluminum hinge rod and brass bushings. Pressure drops, fan speeds and horsepower to be adjusted for sound block. Units to have wall caps, brick vents, roof caps, where required and/or shown. Controls to be Solid State control, unless otherwise indicated. Where units are used for inline applications, provide inlet duct collar and delete face grille.

3. Inline centrifugal fans shall be constructed of welded steel, inlet and outlet diameters shall be the same size. The fan wheels shall be the backward curved centrifugal type with non-overloading characteristics, constructed with die-formed, aerodynamic blades, continuously welded to a flat radiant blackplate.

PART 3 EXECUTION

1. Provide all hanging materials and vibration isolation prior to hanging any unit, verify supports with Structural Engineer.
2. Provide prefabricated roof curbs for all roof mounted equipment. Unibeam Sonotrol type, minimum 12", all galvanized continuously welded construction with integral cants. Minimum 2" thick walls filled with insulation. Provide additional wood nailers so that fan bases rest level on curbs.
3. Provide wall caps or roof caps for ceiling fans flashed and secured as required.
4. All rooftop fans, gravity ventilators and utility sets shall be factory painted color selected.
5. All fans with duct connections or connections to building construction shall have flexible connections as specified in Section 15860.
6. All exhaust fans shall have backdraft dampers.

END OF SECTION
15810.6362

SECTION 15860 - DUCT SYSTEMS

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:
 - A. All sheet metal work required for the various systems, including installation of control devices and connections to equipment and all materials and specialties required for the proper functioning of the work.
 - B. All acoustical treatment required for the work as hereinafter specified.
 - C. All gas vents.

1.02 CONSTRUCTION

1. All ducts shall be constructed of prime quality, re-squared, galvanized steel sheets in accordance with "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems" of the "Sheet Metal and Air Conditioning Contractors National Association", (SMACNA) Sections 1 and 2.
2. Gauges shall be as recommended for the use intended in the applicable SMACNA Manuals. All ductwork and other sheet metal shall be properly stiffened and supported as per the applicable recommendations of SMACNA Manuals. Only first quality, smooth, cold rolled sheets of the best grade steel shall be used and shall be guaranteed to double seam without showing fracture.

1.03 DUCTWORK CLEANLINESS AND STORAGE

1. Comply with SMACNA, "Duct Cleanliness for New Construction Guidelines," and follow the requirements for the "Advanced Level." After fabrication, seal ductwork and maintain the sealed conditions during transportation, storage and after installation until final cleaning is complete. All ductwork shall be sealed either by blanketing or capping the duct ends, bagging small fittings, surface wrapping or shrink wrapping. Store in a clean, dry environment. Do not install ductwork until the building is clean and dried and maintain the integrity of the sealed ends until final "white glove cleaning" is complete and dust free.
2. Duct installed and where the duct joints have had sealant, do not cover duct openings until sealant has cured. All work on preventing buildup of the sealant gases shall be done in accordance with sealant manufacturer's requirements and SMACNA.

1.04 FLEXIBLE DUCTS

1. Use corrugated solid metal flexible duct for inlet connection to air control devices such as V.A.V. boxes, etc. Use corrugated aluminum or core polyester core (insulated) for connections on outlet-side of air control devices and low velocity runouts.
2. Ducts must be suitable for the service of acceptable fire rating and shall be insulated as specified for ductwork.

SECTION 15860 - DUCT SYSTEMS

3. Flexible ducts shall be run in the most direct manner and shall be hung so that no bend has a centerline radius less than three times its diameter, maximum 12' +/- . Duct found not in compliance shall be removed and installed to comply with this section at no additional cost.
4. Substitution of flexible ducts for runouts shown as sheet metal or vice versa is acceptable but must be submitted for approval.
5. Flexible duct shall not pass through any wall, draft stopping wall, floor, ceiling or fire resistance rated assembly. Where flexible duct is shown thru these, provide sheet metal collar thru wall and minimum 6" either side.
6. All duct wraps, insulation and appurtenances shall be plenum rated.
7. Flexible duct on inlet to VAV boxes shall have minimum straight run of duct as required and recommended by the VAV box manufacturer.
8. Where flexible ducts are shown to be connected to return air or supply air plenum boxes, the duct connections shall be made to allow for installation of plenum boxes thru ceiling and/or down from roof.

1.05 EXPOSED SPIRAL DUCT

1. All exposed round duct in finished spaces shall be continuous spiral duct. Spiral duct shall be manufactured from galvanized steel ASTM-A-527-71. All ductwork is to be manufactured and installed with materials, fittings and joints designed to be exposed. Duct fittings, air devices and all appurtenances shall be prepared for painting as specified in Section 15010 and be painted color as selected by Architect. Where duct is specified to be acoustically insulated, United Sheet Metal Type "K-27" or approved equal duct to be used.
2. Where spiral duct is shown to be mounted between exposed steel or parallel with steel, the duct shall be installed at same slope roof steel.
3. All ducts shall be painted color selected. All duct, air devices, supports and appurtenances shall be painted.

1.06 EXPOSED NON-SPIRAL DUCT

1. All exposed duct not of spiral construction shall not have raised duct joints "Ductmate" or other type of similar joints. All ductwork is to be manufactured and installed with materials, fittings and joints designed to be exposed and unpainted (except where noted on the drawings). Duct to be painted color selected.
2. Only where indicated on the drawings, duct shall be galvanized prepared for painting using duct as indicated below. Galvannealed duct may be used.

1.07 PAINTING OF SHEET METAL DUCTS

1. Where exposed duct is to be painted, the following is a guide for surface preparation.
 - A. Surface shall be clean, dry and free from spiral manufacturers' lubricants.

SECTION 15860 - DUCT SYSTEMS

- B. Remove dirt and grease from galvanized spiral ductwork with water and a non-petroleum-based detergent (Simple Green, TSP, Krud Cutter, Dawn, or approved equal) and wipe dry with a clean cloth.
- C. Surface shall be free of foreign materials that will adversely affect adhesion or appearance of applied painted coating.
- D. Contractor shall use DTM (direct to metal) Sherwin Williams paint.
 - 1. Primer/Topcoat – Sherwin Williams B42W Series or approved equal
 - 2. Primer/Topcoat – Sherwin Williams B42T1 or approved equal
- E. All oil-based paint shall be in accordance with manufacturers' recommendations for surfaced preparation and primer requirement.
- F. The use of alkaline oil-based paint shall not be used.

1.08 BALANCING AND TESTING

- 1. See Section 15190.

1.09 DIMENSIONS

- 1. Duct dimensions are **INSIDE CLEAR DIMENSIONS**: Increase metal duct size to allow for thickness of inside insulation.

PART 2 PRODUCTS

2.01 FITTINGS

- 1. Round elbows shall be formed or stamped type; use five-piece construction where stamped fittings are available, centerline radius equal to 1.5 times the duct diameter minimum.
- 2. All round take offs to be expanded to 90-degree conical type of 45-degree branches.
- 3. Obstructions: Where possible, avoid locating any pipe, wire or structural member in a duct. Where such obstructions cannot be avoided, duct shall be eased, split or transformed as the Engineer may direct.
- 4. Transformation: Where changes result in an increase of area slope shall not exceed one (1) in seven (7); where areas remain constant or decrease, slope shall not exceed one (1) in four (4), but one (1) in seven (7) is preferable.
- 5. Changes in direction: Changes in direction shall be made with elbows or tees as conditions necessitate in the following order or preference:
 - A. Unvaned elbow, centerline radius equal to 1.5 times duct width.
 - B. 6" throat radius with full radius vanes and heel radius.
 - C. 3" throat radius with full radius vanes and heel radius.
 - D. 3" throat radius with 3" heel radius, double thickness vanes.
 - E. No square elbows without turning vanes allowed.

SECTION 15860 - DUCT SYSTEMS

6. Branch Takeoffs: Made, in order of preference, with radius elbow, radius tap-in or suitable vanes in a square takeoff.

2.02 JOINTS

1. All connections of duct shall be installed in strict accordance with SMACNA standards, except that all exposed non-spiral duct with design pressure less than 2" W.C. or 2,500 fpm velocity in finished areas shall use streamline joints.
2. Mechanical joint fasteners, such as "Ductmate" or approved equal, will be allowed and shall be installed in strict accordance with manufacturers' requirements. Where mechanical fasteners are used, Contractor shall coordinate joint locations with all other trades for clearances. Where use of mechanical fasteners result in an increased requirement for space and clearance and results in modification, removal, replacement, or new work for the Contractor or other contractors work; the work shall be done at the Contractors' expense and with no additional cost to Owner. These joints shall not be used for exposed duct in furnished areas.
3. Where any joint is installed in any duct below 7'0", installation shall have protection as specified under ductwork installation.
4. All joints shall be sealed as specified for air tightness.

2.03 DAMPERS

1. Furnish and install all dampers. Dampers for automatic operation shall be minimum leakage, multi-opposed type with neoprene balloon edge and snap steel side.
2. Outside air dampers for rooftop units shall be able to be closed within 30 seconds.

2.04 VOLUME DAMPERS, SPLITTERS AND ADJUSTABLE DEFLECTORS

1. Volume dampers shall be installed in all of the trunk and branch ducts, no exceptions. The balancing trade shall not depend upon register shutters or dampers for balancing. The sheet metal contractor shall submit shop drawings to the balancing contractor for his review of location, type, size, and quantity of balancing dampers. Where additional control devices or alternate methods of duct installation are suggested and/or required, these shall be provided, and all modifications made at no additional cost to Owner.
2. Volume dampers shall be Everlock locking type manual volume dampers as manufactured by Rossi HVAC Hardware or approved equal.
3. Bracket – Cold rolled Steel (ASTM A-1008), 18-gauge nominal thickness of 0.0478 with tolerance range of 0.0438 to 0.0518. single cut and formed bracket for use with 1.5" or 2.0" insulation wrapping or any other such stand-off applications. Finished with a white Chromate plating.
4. Handle and Thumb Trigger – Polyamide 66 (PA66), flame retardant, glass reinforced, "Zytel".
5. Retaining Spring – Carbon steel SAE 1074 with zinc bright plating. C-scale Rockwell hardness 47 to 51.

SECTION 15860 - DUCT SYSTEMS

6. Blades
 - A. 4" to 14" dia. single blade (or disc). ASTM-A527 LFO G90, 20-gauge reinforced to equal strength of 18-gauge material.
 - B. 3/8" full length bar fits through formed channel in center of damper blade.
7. Bars – 3/8" square aluminum bar.
8. Bearings
 - A. Snap-in bearings for medium and low-pressure systems; flame retardant, glass reinforced, "Zytel" or approved equal.
 - B. B-lined bearings for lined duct. Polyamide 66 (PA66); flame retardant, glass reinforced, "Zytel" or approved equal.
9. Splitter dampers shall be installed where shown on drawings. Splitters shall be made of 18-gauge galvanized steel or heavier and shall be cross broken and flanged or hemmed for rigidity. Splitters shall be made easily adjustable and readily accessible for adjustment.
10. Adjustable deflectors and adjustable turning-vane devices for diverting air flow from a duct main into a branch duct shall be multi-blade assembly hinged at one end and so constructed that, as it is closed, the air passage between the blades narrows until no air passage remains when the assembly is in the fully-closed position.

2.05 FIRE DAMPERS

1. Fire dampers shall be provided and installed at all places where duct passes through a floor, fire wall, fire rated ceiling or other fire division, or as required by applicable codes.
2. Steel curtain dampers may be used in any system but are required 100% free area.
3. Fire dampers shall comply with UL-555 and shall bear the label of an approved agency. Fire dampers shall be installed in accordance with manufacturers' installation instructions.
4. Provide access doors at all fire dampers.
5. The Contractor shall, prior to shop drawing preparation, coordinate with general contractor, the location of all fire dampers based on architectural plans and/or existing construction. Where access doors are required behind any inaccessible area, the Contractor shall furnish and install access panels in general construction which shall be suitable for servicing of dampers.
6. Where due to existing and/or new construction of any trades, access to fire dampers are not possible prior to duct installation. The Contractor shall notify the architect and/or engineer.

2.06 ACCESS DOORS

1. Access doors of suitable sizes minimum 18"x18" shall be provided for access to all coils, dampers, controls, etc.; in insulated duct, door shall be double panel, insulated type.

SECTION 15860 - DUCT SYSTEMS

2.07 FLEXIBLE CONNECTIONS

1. Flexible connections shall be provided to motorized equipment, made with at least 3" of neoprene coated fiberglass cloth with 1" slack material (except kitchen hood exhaust).

2.08 LOUVERS AND SCREENS

1. All louvers shall be 45 degree, 4" deep, drainable louvers. Blades shall be stationary with two (2) drainable gutters incorporated. Head/jamb frame shall be drainable and resist water penetration. Material shall be 0.081" extruded aluminum. Provide optional welded frame, bird/inset screen, as manufactured by Airo-lite Model K6844 or approved equal. Provide insulated blank off panel with 0.032" aluminum skin to match louver finish. Coordinate and provide necessary trim and attachment details.
2. Louver panels shall be continuous within the specified masonry openings. Coordinate required sizes, total depth, offset to new equipment, etc. with field conditions and necessary modifications, attachment methods, gaskets, etc. Seal perimeter so not to restrict louver drainage mechanism. Document and submit field verified and equipment coordinated louver specifics via shop drawing submittal. Finish shall be Owner/architect selected custom color (non-metallic and non- exotic) Kynar (or approved equal) painted finish to match brick or Owners' color sample.
3. An aluminum painted screen (1/2 " mesh) in an aluminum frame shall be provided over the louver in such a way as to be easily removable for maintenance.
4. Where air intakes or relief discharges occur on roofs, prefabricated aluminum curbs (maximum height 12"; minimum height 4") shall be provided one inch higher than gravel stop or parapet scuppers and properly flashed. Aluminum rain hoods or goosenecks, unless otherwise shown, shall be provided thereon, so designed as to prevent rain entrance, provide low frictional resistance and have rigid construction, each provided with removable screen.
5. Where louvers have internal components and/or their associated dampers as indicated on drawings and/or specifications, all internal portions shall have a metal protective screen. Screen shall be constructed to allow for specified air flow.
6. Screen shall be of adequate size, dimension and configuration to allow for proper air flow and protection of internal components.
7. Provide hinged access for components requiring maintenance.
8. Screen shall be removable. Paint screen and all components color selected.

2.09 FAN DISCHARGE, BACK DRAFT AND RELIEF DAMPERS

1. Air/Dynamic as manufactured "Air Balance" or approved equal.

2.10 NEW BOILER VENT

1. The Contractor shall verify with flue manufacturer for delivery dates.

SECTION 15860 - DUCT SYSTEMS

2. New boiler vents shall be constructed of UL Listed Type AL-294-C stainless steel. Provide all hangers, supports and wall support roof penetrations.
3. Provide caps at top of stacks.
4. Provide all drip points for condensate piped thru condensate neutralizer to floor drains per boiler manufacturers' requirements.
5. Installation shall be in accordance with manufacturers' requirements. Contractor, as part of shop drawing submittal for flues, submit to boiler manufacturer for their review and approval.
6. For vents shown to be installed in existing chimney, modify chimney and opening for installation. Provide stainless steel closure at top and at bottom.
7. Where there are multiple flues in close proximity to each other, less than 12". The flue heights shall vary, minimum 12", to prevent freezing of flues.

2.11 DUCT IDENTIFICATION

1. Provide for all concealed insulated and non-insulated duct and duct exposed in non-finished areas; self-adhesive color-coded labels for identification of air flow and equipment.
2. Markers shall be installed at every turn in direction and minimum every 25'.
3. Markers shall have color coding per the manufacturer. In addition to marking, the duct shall have flow directions located next to duct markers.
4. Flow directional tape shall be completely around all visible portions of duct and termination shall be 1' +/- past visible corner. Flow directional tape shall be ASME A13.1 color coding. Color to match duct markers. Arrows shall be white on green, red or blue and black on yellow, green or orange.
5. The duct shall have flow direction located next to flow direction. Indication shall be MS900 flow directional tape; 2" wide for duct up to 12' +/- AFF and 4" wide for duct above 12' +/- AFF.
6. Markers shall have color coding and lettering per the manufacturer and meet ASME A13.1 Standards.
7. Duct markers shall be; duct up to 12' +/- AFF – 2-1/4" x 13" and duct above 12' +/- AFF – 4" x 24".
8. Duct markers shall be MSI MS-900 or approved equal.

PART 3 EXECUTION

3.01 AIR DELIVERY AND NOISE

1. The Contractor shall guarantee that all equipment shall operate without objectionable noise or vibration; that all ductwork shall be free from pulsation or objectionable noises; that the volume of air specified will be delivered to all points of supply and exhaust.

SECTION 15860 - DUCT SYSTEMS

2. After this system is in operation, should the ductwork be found to vibrate or chatter, Contractor will be required to eliminate same.

3.02 TESTING OF AIR DISTRIBUTION SYSTEM

1. The volume and velocities of air at all terminals, outlets and inlets, shall be tested.
2. The volume dampers, splitters and deflectors shall be adjusted so that the air velocities and volume will be as specified.
3. See Specification Section 15010 "Start Up and Adjustments" and 15191 for balancing and testing.

3.03 DUCTWORK INSTALLATION

1. All ductwork shall generally be installed in the location and manner shown and detailed on the drawings with all fittings and connections made in accordance with the applicable SMACNA Manuals. Duct shown on drawings are diagrammatic. Contractor to determine in field exact routing, size and configuration. All modifications or deviations required by job conditions must be approved prior to any fabrication.
2. Prepare all ductwork and set it in place before furring begins. Extend all damper operators and serviceable or adjustable devices to accessible locations.
3. All connections from sheet metal assemblies such as ductwork, plenums, etc., to operating machines and/or mechanisms such as fans, air conditioners, etc., shall have flexible connections.
4. Where any ductwork is mounted lower than 7'-0" above a finished floor line, all seams in ducts shall be flattened and filed so that no standing seams or angle bracing protrudes from the duct in any manner which could cause injury to personnel. Covering of standing seams with an approved flexible bumper material, like split Armaflex pipe insulation or approved equal is acceptable.
5. Coordinate exact location of all duct in field with existing construction. Coordinate location of all duct with truss manufacturer.
6. All ductwork shall be delivered and sealed in accordance with SMACNA requirements and sealing shall only be removed prior to installing duct. After installation, duct shall still be protected from water damage.
7. All labels on exposed and concealed duct shall be removed.

3.04 ACOUSTICAL TREATMENT

1. Unless otherwise noted, all duct from all fans and units with fans to 20' from fans shall be acoustically insulated. Ducts to be acoustically insulated shall be insulation in the interior of the duct with 1" thick, 1-1/2# density fiberglass meeting ASTM C1071, coated with acrylic treated EPA registered anti-microbial agent proven to resist microbial growth as determined by ASTM G21 and G22, K value :25 at 75 deg. F., N.R.C. .65 or higher based on type A mounting and listed in accordance to ASTM C-423.

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2. Rectangular duct shall be secured using full coverage water based adhesive meeting ASTM C916. Secure insulation with mechanical lines fasteners per SMACNA, NAIUI or manufacturers requirements. All exposed edges of the insulate shall be factory or field coated. Repair liner surfaces with adhesive. Insulate may be installed after duct fabricator at contractors' option. Increase duct size to allow for insulation thickness.
3. Insulation shall be pasted to the metal surface with "3M" EC-890 or approved equal, before duct is made up. On large ducts, stick pins stud-welded or pasted shall be used as additional support. Insulation may be installed after duct is fabricated at Contractor's option.
4. Duct insulation and linings shall not glow, flame or smolder when tested at their rated temperatures in accordance with ASTM-C-411, test temperature 250° F. or greater. Duct liners shall be interrupted at fire damper and fire doors.
5. Where acoustical insulation is installed, exterior duct wrap is not required unless acoustical insulation does not meet the specifications for duct insulation R Values as indicated in Section 15180.
6. All acoustical insulation shall be plenum rated.

3.05 ROOF PENETRATIONS

1. All roof penetrations shall have roof curb minimum 12" high with cant strip, flashing collars, flashing and counterflashing.
2. Provide sloped roof curbs at sloped roofs. Verify all curbs with roof conditions prior to shop drawing submission.
3. All roof curbs shall be installed per SMACNA requirements.
4. Where re-roofing work requires higher curbs due to new insulation, these shall be used. Coordinate with Contractor for exact location.
5. Gooseneck terminations are not permitted.

3.06 AIR TIGHTNESS

1. All ductwork shall be airtight as defined by ASHRAE and SMACNA. All transverse, joints longitudinal seams and duct wall penetrations shall be sealed in accordance with ASHRAE 90.1 latest edition and have adhesive (3M EL-750 or approved equal). Pressure sensitive tape shall only be allowed for supply air duct with design pressures less than 2" W.C. in return air plenums.

3.07 FAN DUCT CONNECTION

1. All duct connections to fans and/or equipment with fans shall be installed in strict accordance with fan manufacturer's requirements. Ducts shall be installed to eliminate any system effects pressure losses. Where ducts are shown or are required to be installed that are not in compliance with manufacturers requirement, the additional pressure losses due to the system effect shall be added to the fans specified static pressure and fan size increased accordingly. All work shall be done at no additional cost.

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2. Where elbows are required at discharge, they shall be full radius elbow $R/W = 1.5$ or greater.
3. All discharge dampers shall be arranged and installed in accordance with manufacturer's requirements and to avoid any system effects.

3.08 EXISTING DUCT

1. All existing duct regardless of use that is shown to remain and/or to be used for new work shall be cleaned. Duct cleaning shall be accordance with duct cleaning specification.

END OF SECTION
15860.6362

SECTION 15870 - TEMPERED AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all air terminal devices in sizes, types and capacities shown on the drawings.

1.02 RATINGS

1. Manufacturer shall rate all terminals in accordance with Air Diffusion Council (where applicable).

PART 2 PRODUCTS

2.01 REGISTERS AND GRILLES

1. All supply air registers shall be METAL*AIRE Model V4004D-1 or approved equal consisting of two (2) banks of fins, front bank vertical, second bank horizontal, with one (1) bank of multi-opposed damper blades operated by a concealed screwdriver operator.
2. All return and exhaust air registers shall consist of one (1) bank of horizontal fins fixed at a 45-degree angle with one (1) bank of multi-opposed damper blades operated by a removable key.
3. Where grilles are shown, omit the damper.
4. All registers and grilles shall be of aluminum construction with baked white enamel finish.
5. Return air grilles open to ceiling return air plenums shall have prefabricated acoustical return air canopy. Size of canopy shall match grille size.
6. For all registers on exposed duct; Titus Model 5300FL or approved equal.

2.02 DIFFUSERS

1. All ceiling diffusers shall distribute air in a horizontal pattern parallel to the ceiling.
2. All diffusers shall be equipped with opposed blade dampers, operated from diffuser face by an unobtrusive screw operator.
3. All diffusers shall be perforated style METAL*AIR Model 7500-6 AF or approved equal for lay-in ceilings. Face size shall be 24"x24". All diffusers shall be steel construction with aluminum face plates. The finish shall be white baked enamel with black back pan and interiors.
4. Variable Air Volume Square Diffusers (CD-1 thru CD-4) - Install, where shown on plans, METAL*AIR Model 5750-6 or approved equal as Unit-Flow plaque ceiling diffusers or approved equal. The diffuser sizes shall be nominal 24"x24" as scheduled, with minimum 18" square flat appearance panels. The diffusers shall be either aluminized steel or aluminum construction and shall be designed to integrate with the specified ceiling system

SECTION 15870 - TEMPERED AIR TERMINAL UNITS

type (refer to architectural reflected ceiling plan). The diffuser shall consist of a back pan and a removable heavy gauge appearance panel attached to the back pan via four (4) latch tabs. The appearance panel shall have aerodynamic, rigid, hemmed edges around the perimeter and shall be a single piece construction. The panel shall be flat and smooth and shall be free of any welding or forming blemishes. The horizontal air discharge pattern shall be 360-degree type. Baffles shall be provided for directional control as scheduled on shown on the drawings. Diffusers that meet the performance requirements are acceptable. Diffuser finish shall be #01 white. Provide published performance data determined in accordance with the latest ANSI-ASHRAE standard for throw, pressure and sound.

2.05 VARIABLE AIR VOLUME BOXES

1. Furnish and install pressure independent variable air volume control boxes. Factory preset maximum and minimum air flow rates shall be adjusted.
2. Casing shall be 20-gauge galvanized steel with rectangular discharge. One-piece aluminum backdraft damper on fan discharge, factory set and aligned for leak rate of 2% at 0.5 S.P. Interior surface of casing shall be acoustically and thermally lined with ¾" thick, 4-pound dual density glass fiber insulation with high density facing. Insulation shall conform to UL 181 and NFPA 90.
3. Air valve shall be die-cast aluminum airflow control device with integral actuator. Integral sensor with taps and calibration chart to measure airflow within +/- 5% for 1½" diameters of straight duct. Leak rate four percent at 3" S.P.
4. Volume damper shall be factory installed extruded aluminum air modulating device. Movement of gate damper is linear with actuator stroke and perpendicular to airflow. Leak rate 6% at 3" SP.
5. Minimum Limiter shall be factory mounted and wired to actuator to provide a minimum cfm stop on unit.
6. Volume regulator shall be a thermostatically reset velocity controller which provides constant delivery air control within +/- 5% of rated from and down to 25% of unit rated cfm, independent of changes in system static pressure. Factory calibrated field adjustable setpoints provided to set maximum and minimum cfm.
7. Electronic controls shall consist of electronic pressure independent controller averaging differential pressure sensor, pressure independent thermostat with exposed setpoints, air valve actuator, transformer, air pressure switch, duct sensor and all wiring.
8. Hot water heating coil shall be either factory or field installed and be of size, capacity and arrangements as indicated on plans, see Section 15760. Provide access panels for access to coil.
9. Attenuator shall be 26-gauge galvanized steel with high density, mat faced insulation, UL listed and meets NFPA 90 A requirements.
10. Provide octopus duct connection with each outlet having a balancing damper.

SECTION 15870 - TEMPERED AIR TERMINAL UNITS

PART 3 EXECUTION

3.01 INSTALLATION

1. All devices shall be mounted true and square, pulled up tightly without distortion.
2. Provide equalizing deflectors and/or air extractors where required to achieve proper air distribution.

3.02 FIRE RATED CONSTRUCTION

1. All devices in fire rated construction shall be provided with approved fire dampers, "tents", or other devices as required to conform to applicable regulations.

3.03 VISIBILITY

1. Where registers and grilles are at floor level and inside of duct is visible, provide acoustic insulation (black) or where insulation is not specified or required, paint all visible inside surfaces of duct flat black.

END OF SECTION
15870.6362

SECTION 15930 - FACILITY MANAGEMENT CONTROL SYSTEM

PART ONE – GENERAL

1.01 SCOPE

1. Provide a fully integrated Web Browser Control System incorporating Niagara Tridium Direct Digital Control (DDC) Technology with energy management, equipment monitoring, and remote communications.
2. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating on an open protocol network to the Individual Building Master Network controller. Access to the various Building Management Control Systems shall be locally from any computer or from the existing computer located in the building or remotely from any web access site and shall be accomplished through a Graphical User Interface using Web browser technology via the Internet.
3. The School Districts' Information Technology Department will provide two (2) IP drops for integration into the Information Technology System. The School District Information Technology Department will provide a secure VPN into the network to all for remote monitoring of the system to meet section 1.02 Maintenance Trending Requirement.
4. Provide Connections to all equipment requiring connections to the control medium whether furnished under this Section or not.
5. The system shall use the latest technologies available from the manufacturer in the implementation of Tridium Direct Digital Electronic Control for the HVAC system and its management.
6. The systems shall be installed by factory-trained technicians, regularly employed by the manufacturer and factory trained in the installation and calibration of the product.
7. System shall be installed and serviced by technicians that are factory trained in the installation and calibration of the equipment.
8. Provide system in accordance with specifications.
9. The installing contractor shall be a Certified Tridium Installer by the DDC Control Equipment Manufacturer. The Contractor shall include the Certification Documents from the DDC Control Equipment Manufacturer in the Shop Drawing.
10. The installing contractor will be required to provide emergency service personnel on during normal working hours.
11. The installing contractor shall be NJ DPMC pre-qualified under Classification C043 – Control Systems with an aggregate amount equal to or greater than \$15,000,000.00.
12. Contractor shall be responsible for all software, data drops, programming, calibration, the proper operation and adjustment of all controls, dampers and appurtenances to provide required sequence of operations and protection against freeze-ups. Provide system in accordance with specifications.

SECTION 15930 - FACILITY MANAGEMENT CONTROL SYSTEM

13. Contractor shall provide all labor, material, equipment and software not specifically referred to herein or on the plans, that are required to meet the functional intent of the 15930 specifications and shall be provided without any additional cost to the Owner. Contractor shall furnish all electrical control and interlock wiring connected to the controls and instrumentation systems. All 110 VAC or greater voltage power wiring to main control panels shall be provided by Contractor, unless indicated otherwise in the Contract Documents.
14. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use.
15. Contractor shall be responsible for installation of all field equipment and the communication transmission bus. The DDC contractor shall supply all necessary electrical power to each controller and provide transformers as required from the electrical power panel source.
16. Contractor shall have project's lead technician attend all commissioning meetings. Contractor shall complete and provide to the CM and Cx all factory startup reports, and pre-functional documentation provided by the Commissioning Agent.
17. The installing contractor shall be certified in network security. Upon award, Contractor shall provide to the Owner a Certified Compliance Statement documenting that the system has been protected against outside network intrusion. It is a requirement of this installation of this FCMS that this system is compliant with the Information Security policies and procedures of this county. Upon completion of this system, a Vulnerability Assessment shall be performed to identify current vulnerabilities and reduce the Information Security Risk for the county, architect and MEP professionals. The awarded contractor shall provide expert advice and consultation to maintain a security posture for the organization. FCMS must be designed with a credentialed Information Security professional. Contractor personnel involved with Vulnerability Assessments and Information Security consulting must possess a current Certified Information Systems Professional (CISSP) Certification and be a member of ISCC2. An ISC2 CISSP Certification is required. These certifications shall be provided upon award of bid; no exceptions.

1.02 WARRANTY

1. Provide the following warranties by the installing Automatic Temperature Controls (ATC) manufacturer:
 - A. Warranty on all BAS equipment and installation.
 - B. Warranty on software upgrades.
 - C. Warranty on firmware upgrades.
2. Labor and materials for the control system specified shall be warranted free from defects for a two (2) year period as indicated in "General Conditions". Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. Contractor shall respond to the Owner's request for warranty service with 4 hours during normal business hours.
3. All work shall have a single warranty date. The date of "Substantial Completion" shall start the warranty. Please refer to the AIA A201 Contract Section 9.8 for the definition and requirements of substantial completion.

SECTION 15930 - FACILITY MANAGEMENT CONTROL SYSTEM

4. The Owner shall grant to the temperature control subcontractor reasonable access to the FMCS during the warranty period. The Owner shall allow the contractor to access the FMCS through a School District provided VPN from a remote location for the purpose of diagnostics and troubleshooting, via the internet, during the warranty period.

1.03 ACCEPTABLE BAS CONTROL CONTRACTORS:

1. CM3 Building Solutions – Fort Washington, PA
2. Siemens Building Technologies - Branch Office Blue Bell, PA
3. Or approved equal.

1.04 POST CONSTRUCTION MAINTENANCE SERVICE

1. In addition to warranty periods per the General Conditions, provide maintenance service per Specification Section 15010.
2. The base contract shall include a 2-year service/maintenance term in addition to the 2-year bonded General Contract warranty. The 2-year controls services shall include:
 - A. **Trending:** and logging remotely from the control's provider Remote from the building. A sampling of rooms as agreed by the owner include at least 20% of the rooms shall be trended to confirm proper temperature ranges are maintained.
 - B. **Alarm Monitoring:** The alarm reports shall be monitored remotely, and all alarm issues need to be addressed daily. Contractor shall provide a weekly report that summarizes the alarm issues and the remedy actions taken.
 - C. The trending shall be summarized in a **weekly email report** to the owner. All rooms outside of the temperature and proper operating ranges shall be highlighted in the report.
 - D. The weekly email report shall be discussed in a pre-set time **conference call** that occurs every week.
 - E. Once a month, a project specific technician shall **meet onsite** with the Owner to review the weekly reports. The meeting onsite shall be a minimum of 4 hours with onsite verification, tweaking, calibrating and replacing necessary parts and operations as required to maintain the system.
 - F. Provide continued **Owner training** over the 2-year term of 24 hours.

1.05 QUALITY ASSURANCE

1. All system components shall be fault tolerant and provide satisfactory operation without damage at 110% and 85% of rated voltage and at + 3 hertz variation in line frequency.

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2. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interface. All bus connected devices shall be a.c. coupled or approved equal so that any single device failure will not disrupt or halt bus communication.
3. The Manufacturer of the Facility Management Control System shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). The intent of this specification requirement is to assure that the products from the Temperature Control System Manufacturer are delivered through a Quality System and Framework that will assure consistent quality in the products delivered for this project.
4. Product literature provided by the Building Management Control System Manufacturer in the submittal package shall contain the ISO-9002 Certification Mark from the applicable registrar.

1.06 TRAINING

1. All training shall be by the FMCS manufacturer and shall utilize specified manuals, as-built documentation, and the on-line help utility.
2. Operator training shall include four 8-hour sessions of four 4-hour sessions of training in addition to the instructions specified in Section 15010.
 - Sequence of Operation review.
 - Sign on-Sign off
 - Selection of all displays and reports.
 - Commanding of points, keyboard and mouse mode.
 - Modifying English text.
 - Use of all dialog boxes and menus.
 - Modifying alarm limits and start-stop times.
 - System initialization.
 - Download and initialization of remote controllers.
 - Purge and/or dump of historical data.
 - Troubleshooting of sensors (determining bad sensors).
 - Password modification.

1.07 SUBMITTALS

1. Shop drawings and Product Data: Submit under provisions of General Conditions, shop drawings.
2. Product Data: Catalog sheets, specifications, control/wiring, schematic drawings, installation instructions for each item furnished. Include the valve and damper schedules and communications layout of DDC control system.
3. Shop Drawings:
 - A. List of connected data points, including connected control unit and input device.

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- B. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
 - C. System configuration with peripheral devices, batteries, power supplies, diagrams, modems and interconnections.
 - D. Descriptive data and sequence of operation of operating, user and application software including Web Browser software/hardware integrations.
 - E. Flow charts showing the logic sequence for each panel. Provide a non-jargon description for each step in the sequence. In addition, identify which variables are built into the system programming, and which have variable names and can be changed by the operator(s) from the Central Processing Unit.
- 4. Maintenance Data and Operation Instructions: Upon completion of the work and prior to final acceptance, provide copies of "Systems Operation and Maintenance Manuals" for the installed control systems. Manuals shall consist of copies of all temperature control submittals, including schematic diagrams, panel drawings, components parts, Web Browser Networks, accessories, operation and maintenance instructions, recommended spare parts inventory and complete warranty information.
 - 5. ATC contractor is required to provide a written report stating whether or NOT any equipment furnished by ATC contractor is eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings®). The report is to be submitted with original shop drawing submittal. Report shall include all supporting equipment specification sheets, applicable AHRI Certificate and any other documentation required. (Note: a negative report MUST be submitted where applicable). Refer to specification 15010 for HVAC Equipment which may qualify for Smart Start Incentive for "Controls".
 - 6. Provide a Maintenance Service Agreement documenting the responsibilities required in Part 1.07 of this specification.

1.08 SYSTEM DESCRIPTION

- 1. This specification defines the minimum equipment and performance requirements for a complete Facility Management Control System for the listed buildings HVAC/Mechanical Systems including terminal equipment.
- 2. It shall be understood that the drawings and specifications describe the approximate locations of the work. Do not scale the drawings to determine exact positions and clearances.
- 3. Details of construction and of workmanship where not specifically described herein or indicated on the drawings shall be subject to review by the school. It is the intent of these specifications to provide a complete system, left in good working order, ready for operation, including necessary labor and materials, whether specifically shown on the drawings or mentioned herein.
- 4. Before submitting proposals, examine the specifications and all drawings relating to the work and become fully informed as to the extent and character of the work and the relation of the work to that of other Sections. Examine the drawings of other Buildings Control Systems to become familiar with all the problems and details of the building construction.

SECTION 15930 - FACILITY MANAGEMENT CONTROL SYSTEM

5. Automatic temperature control field monitoring and control system using field programmable microprocessor-based units with web browser communications are the intent of this design.
6. Entire system is to be installed by the System Manufacturer or factory authorized representative.
7. The installation shall comply with local, state, and federal code requirements as applicable.
8. This contract also includes the creation of Systems Graphics at the new FMCS front end computer. The Graphics Programming includes Graphics creation and Dynamic Point editing to reflect all HVAC systems and Hardware System points specified in Part 4.

1.09 NEW CONTROLS ON EXISTING REMAINING EQUIPMENT

1. The existing equipment that is to remain and be replaced shall have new controls.
2. The existing controls shall be completely removed. This shall include, where applicable, existing communication devices in each unit. Contractor shall verify the existing controls and include all costs.
3. Contractor shall include all room sensor, water and air sensors and replacement of any remove devices and associated wiring not able to be integrated into new systems.
4. The new controls shall have sequences that are specified for new equipment. Where new sequences cannot be accomplished with existing components (economizers, reheat, etc.), the existing sequence shall be used.
5. The replacement equipment shall have new points as specified for new equipment.
6. The equipment to remain shall be as indicated on plans. All quantities to be verified.

PART 2 PRODUCTS

2.01 DAMPERS

1. Modulating dampers shall be opposed blade type. Air handling unit outdoor, relief and return air dampers shall be parallel blade type arranged to combat stratification. Two (2) position dampers shall be parallel blade type. Damper frames shall be not less than 13-gauge galvanized steel. Damper blade shall not be over 8" in width and 48" in length.
2. Blade edges shall have inflatable seal edging rated for less than 10 CFM per square foot of damper area. Damper hardware shall be zinc plated; bearings shall be nylon, Teflon, oilite or approved equal.
3. Damper operators shall be mounted outside of duct on device unless factory installed or internally mounted with access panels.
4. Damper operators shall be mounted outside of duct unless factory installed or internally mounted with access panels. All dampers on equipment exposed in finished spaces shall have internal mounted operators, increase duct size accordingly.

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5. Damper end switches shall sense blade position and not controller output.
6. All dampers and damper motors for outside air intakes for all HVAC equipment shall be spring return, quick - acting type.
7. Power wiring 24V or 110V for all dampers shall be provided by the control contractor. Contractor shall verify location of all dampers requiring power and coordinate all other trades for location of power service.
8. Electronic Actuators: Provide actuators with spring return for two-position (24v), 0-5 Vdc, 0-10 Vdc, 2-10Vdc, 4-20 mA, or PWM input (subject to restrictions in Section "BAS Field Panels") as required. Actuators shall travel full stroke in less than 90 seconds. Actuators shall be designed for a minimum of 60,000 full cycles at full torque and be UL 873 listed. Provide stroke indicator. Actuators shall have positive positioning circuit. Where two actuators are required in parallel or in sequence provide an auxiliary actuator driver. Actuators shall have current limiting motor protection. Actuators shall have manual override where indicated.
9. Acceptable Manufacturers:
 - A. Belimo
 - B. Schneider Electric
 - C. Siemens
 - D. Or approved equal

2.02 Control Valves

1. General: Provide factory fabricated control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. The control valves shall be sized by the controls engineer and shall be guaranteed to meet the heating and cooling loads. Provide valve size in accordance with scheduled or specified 4.0 psi maximum pressure drop across control valve. Control valves shall be equipped with heavy-duty actuators, stainless steel trim, and with proper close-off rating for each individual application. Minimum close-off rating shall be as scheduled and adequate for each application and shall generally be considered at dead head rating of the pump. Control valves used for the primary chilled and hot water systems shall have a minimum close-off rating of 200 psid unless otherwise required or specified. All valves will be Pressure Independent Flow Control Valves. All valves shall be fully modulating unless noted otherwise. Valves shall be sized for quiet operation, be equipped with throttling plugs, stainless steel trim, renewable composition discs and be capable of operating at varying rates of speed to correspond with the exact dictates of the controller. Install with stem within 50 degrees of vertical position in horizontal pipe.
2. Plug-Type Globe Pattern for Water Service:
 - A. Valve Sizing: Where not specifically indicated on the control drawings, modulating valves shall be sized for maximum full flow pressure drop between 50% and 100% of the branch circuit it is controlling unless scheduled otherwise. Two-position valves shall be same size as connecting piping.

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- B. Temperature Rating: 25°F minimum, 250°F maximum
- C. Body: Bronze, screwed, 250 psi maximum working pressure for 1/2" to 2"; Cast Iron, flanged, 125 psi maximum working pressure for 2-1/2" and larger.
- D. Valve Trim: stainless steel; Stem: Polished stainless steel.
- E. Packing: Spring Loaded Teflon or Synthetic Elastomer U-cups, self-adjusting.
- F. Plug: Stainless steel, Seat: Stainless steel.
- G. Disc: Replaceable Composition or Stainless Steel Filled PTFE.
- H. Ambient Operating Temperature Limits: -10 to 150°F (-12.2 to 66 °C)
- I. All control valves will be Pressure Independent Flow Control Valves
- J. Acceptable Manufacturers:
 - 1. Belimo
 - 2. Flow Control Industries
 - 3. Schneider Electric
 - 4. Siemens
 - 5. Or approved equal

1.03 TEMPERATURE- RH - CO2 SENSORS:

1. Room Temperature Sensor: Shall be an element contained within a ventilated cover suitable for wall mounting. Provide standard white low-profile insulated base. Provide setpoint adjustment and occupancy override where indicated. Provide setpoint adjustment and occupant override where indicated on plans. Provide protective guard in public spaces where indicated.
 - Sensor Type: 10K type 3 thermistor.
 - Accuracy: +/- 0.4°F at calibration point.
 - Output range: 32 to 122°F.
2. Room Relative Humidity Sensor: Shall be an element contained within a ventilated cover suitable for wall mounting. Provide protective guard in public spaces where indicated.
 - Sensor Type: Thin-film capacitive.
 - Output: 0-100% RH.
 - Accuracy: +/- 2% from 10 to 80% RH.
 - Stability: +/- 1% at 68°F annually for 2 years.
3. Room CO2 Sensor: Shall be non-dispersive infrared (NDIR) diffusion sampling type. Provide sensor within a ventilated cover suitable for wall mounting. Provide protective sensor guards in public spaces where indicated.
 - Range: 0 – 2,000 ppm.
 - Accuracy: +/- 30 ppm +/- 2% measured value.
 - Repeatability: +/- 20 ppm +/- 1% measured value

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4. Single-Point Duct Temperature Sensor: Shall consist of sensing element, junction box for wiring connections and gasket to prevent air leakage or vibration noise. Temperature range as required for resolution indicated for sensor range above. Sensing element shall be platinum RTD, or thermistor, +/- 0.5°F accuracy at calibration point. Acceptable manufacturer's:
 - Dwyer Instruments
 - Minco
 - Schneider Electric
 - Siemens
 - Or approved equal

5. Averaging Duct Temperature Sensor: Shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one lineal foot of sensing element for each four-square feet of cooling coil/duct face area. Temperature range as required for resolution indicated for sensor range above. Averaging sensors shall be provided for mixed air applications and wherever freeze stats are installed. Sensing element shall be platinum RTD, or thermistor, +/- 0.5°F accuracy at calibration point. Acceptable manufacturer's:
 - Dwyer Instruments
 - Minco
 - Schneider Electric
 - Siemens
 - Or approved equal

6. Duct / OA CO2 Sensor: Shall be non-dispersive infrared (NDIR) diffusion sampling type.
 - Range: 0 – 2,000 ppm.
 - Accuracy: +/- 40 ppm +/- 3% measured value.
 - Response: 2 min for 99% step change
 - Repeatability: +/- 20 ppm +/- 1% measured value
 - Acceptable manufacturer's: Dwyer, Vaisala, Schneider Electric, Siemens or approved equal.

7. Duct RH Sensor:
 - Range: 0 - 100% RH.
 - Accuracy: +/- 2% (20 to 95% RH).
 - Repeatability: Less than +/- 0.5%
 - Acceptable manufacturer's: Dwyer, Schneider Electric, Vaisala, Veris or approved equal.

8. Liquid immersion temperature sensor shall include brass thermowell, sensor and connection head for wiring connections. Temperature range shall be as required for resolution of 0.15°F. Sensing element shall be platinum RTD or thermistor; +/- 0.5°F accuracy at calibration point. Temperature range shall be as required for resolution of 0.15°F. Acceptable manufacturer's:
 - Dwyer Instruments
 - Minco
 - Schneider Electric
 - Veris Industries
 - Or approved equal

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9. Pipe Surface-Mount Temperature Sensor: Shall include metal junction box and clamps and shall be suitable for sensing pipe surface temperature and installation under insulation. Provide thermally conductive paste at pipe contact point. Temperature range shall be as require for resolution indicated in paragraph. Sensing element shall be platinum RTD, thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
10. Outside air temperature sensors shall consist of a sensor, sun shield, utility box, and watertight gasket to prevent water seepage. Sensing element shall be platinum RTD, +/- 0.5°F accuracy at calibration point. Acceptable Manufacturers:
 - Minco
 - Vaisala
 - Veris Industries
 - Or approved equal
11. Bipolar Ionization:
 - A. Furnish and install needle-point bipolar ionization units in all new rooftop units, new air handling units, replacement rooftop units, replacement air handlings and new terminal equipment with outdoor air intake.
 - B. The units shall be mounted within the unit and located in accordance with the equipment and ionization manufacturer's recommendations.
 - C. The units shall be sized based on the equipment air quantity and ionization manufacturer's requirements.
 - D. Provide 24V or 110V power depending on unit.
 - E. The ionization unit shall be controlled from the equipment internal controls so that ionization unit is energized whenever unit is energized.
 - F. Ionization units shall be:
 - Split system air handling units; 0-1,400 cfm; GPS Model LGPS-FC24-AC or approved equal
 - Rooftop units 4,800 to 10,000 cm (25 tons); GPS Model LGPS FC48-AC or approved equal
 - Where unit size and air quantity are greater than 10,000 cfm, multiple smaller units shall be used. Where multiple unit size and air quantity are used, the air quantity shall not exceed the ionization units' rated capacity.

2.04 FACILITY MANAGEMENT CONTROL SYSTEM

The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers. The Facility Management Control System shall be comprised of BACnet Ethernet I/P (or BACnet MS/TP in limited locations which may be necessary for integration to mechanical equipment or existing systems). The FMCS shall conform to the following:

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1. Controllers shall be dual port BACnet IP with Rapid Spanning Tree (RSTP) communications protocol. The system shall have the capability to identify failure of a single controller without loss of communication to remaining on-line controllers.
2. The system must provide an onsite data collection and storage mechanism to collect and store a BACnet trend log for all points on site including terminal equipment.
 - A. It must be capable of initiating a secure connection to an offsite storage location and must become part of the building's DDC system.
 - B. Management of the onsite system must be available through a local Ethernet connection that provides management of the physical device and its behavior through a local, built-in web server. This web server must allow for configuration, management and monitoring of the device.
 - C. The device(s) must be able to auto-discover all BACnet devices that are connected to it.
 - D. It must identify all trend logs, controller databases and objects.

2.05 BUILDING CONTROLLERS:

1. The Building Niagara Tridium Controller shall provide the interface between the Building Controller and the field control devices and provide global supervisory control functions over the Mechanical Equipment Controllers, Terminal Equipment Controllers and control devices connected directly to the Building Controller. Controller shall be capable of executing application control programs to provide:
 - Calendar functions
 - Scheduling
 - Trending and Trending Backfill
 - Alarm monitoring and routing
 - Time synchronization
 - Integration of BACnet® devices and BACnet® controller data
 - Integration of MODBUS devices and MODBUS controller data.

2.06 MECHANICAL EQUIPMENT CONTROLLERS:

1. Mechanical Equipment Controllers shall provide high-performance Direct Digital Supervisory Control for all Rooftop AC and Air Handling Units. Communications interface with the Building Controller shall be high speed BACnet Ethernet IP RSTP protocol. The ATC contractor shall be responsible for I/O and safety interface to the mechanical equipment as necessary to meet the specified sequence of operation.

2.07 TERMINAL EQUIPMENT CONTROLLERS:

1. Terminal Equipment Controllers shall provide high-performance Direct Digital Supervisory Control for all VAV Boxes, Fan Coil Units, Unit Ventilators, Duct Heaters and Exhaust Fans. Terminal Equipment controllers shall be provided with dual port BACnet IP RSTP protocol.

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2.08 LAN NETWORK HUBS AND MANAGED SWITCHES:

1. Provide managed switches with support for RSTP (Rapid Spanning Tree) protocol.
2. BAS network shall be configured to prevent LAN communications loss in the event of a single controller failure.
3. The RSTP network shall be restricted to BAS controllers with no other third-party devices or switches installed on the network.
4. The BAS shall provide indication of network activity, speed and status.
5. Provide rack mounting hardware and enclosures where necessary.
6. Required 120 Vac power provided by BAS contractor under this section.
7. Approved manufacturers: Cisco – no exceptions.

2.09 PROTECTIVE FREEZESTATS, FIRESTATS AND SMOKE DETECTORS

1. Provide all new air handling systems to include rooftop units, air handlers and unit ventilators shall have freezestat located on the inlet side of hydronic coils. When its setting is exceeded, perform the following:
 - A. Open control valve on heating coil to full heating and/or close outside air damper and stop fans.
 - B. All protective devices shall be manually reset and shall send an alarm signal to DDC system.
2. Smoke detectors in system greater than 2,000 cfm shall have smoke detector installed in return downstream of filters.
3. Smoke detector well, interlock, control wiring and all appurtenances shall be by Contractor.
4. Upon activation, the smoke detectors shall shut down the air distribution system.
5. Smoke detectors shall be supplied by electrical contractor and wired to fire alarm panel by electrical contractor. Smoke detectors shall be installed by HVAC contractor.
6. The electrical contractor shall verify smoke detector auxiliary contacts.
7. The interlocking of smoke detectors with HVAC equipment shall be by Contractor.
8. Interface existing smoke detectors.

2.10 ROOM SENSORS

1. Room sensors shall be electronic. Sensors shall be adjustable from rooms with limitations able to be set by DDC system. All sensors in non-supervised areas (toilet rooms, cafeteria, gym, corridors and similar areas) shall have lockable metal covers. For sensors on exterior walls,

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provide insulation (minimum 2" thick R=8.0). Provide with pushbutton occupied/unoccupied override.

A. Wall Mounted Combination Sensors (Demand Control Ventilation System Only) - provide wall mounted combination sensors which shall contain a space temperature sensor and CO₂ sensors in a single, decorative housing. The CO₂ sensor shall use single-beam absorption infrared diffusion technology (non-dispersive infrared) and shall have integral programming to perform automatic baseline calibration without use interface. The recommended manual recalibration period shall not be less than five years. Other features of wall-mounted combination sensors shall include:

- Operating Conditions: 60°F.- 90°F. (15°C to 30°C.) and 0% to 95% RH, non-condensing
- Power Supply: 18-30 VAC, 50/60 Hz (18-42 VDC polarity protected)
- CO₂ Sampling Method: Diffusion
- CO₂ Sensor Output: 4 to 20 mA or 0 to 10-volt signal
- Sensitivity: ±20 ppm
- Accuracy: ±100 ppm to 60°F.- 90°F. (15°C. to 32°C.) and 760 mmHg
- CO₂ Sensor Calibration: Single point calibration via push button and LED
- Space Temperature Sensor: 10K ohm ±2% at 77°F. (25°C.) thermistor

B. Combination sensors shall be provided with the manufacturers' recommended carbon dioxide calibration kit. The quantity shall be suitable to initially calibrate each sensor provided for the project.

PART 3 EXECUTION

3.01 ELECTRIC WIRING

1. All power and control wiring in connection with the temperature control system shall be furnished and installed under this contract and shall be per applicable NEC.
2. All electrical controls and switches shall be suitable either for 120 volts, 60 Hz or 24 VAC
3. For control circuits of 115 volts and above, all wire shall be rated for 600 volts and may be either single or multi-conductor cable (refer to section 16000 for acceptable wiring methods).
4. For control circuits below 30 volts, all wire shall be rated for 300 volts and may be either single or multi-conductor cable.
5. All electrical sensing element wire shall be in accordance with manufacturers' recommendation with the proper number of conductors, equivalent to Beldon No. 8770 or approved equal and installed in "EMT" conduit in mechanical room. This cable shall not be installed in the same conduit with any conductors for voltages of 115 or above.
6. Electrical work provided by the DDC contractor/manufacturer shall include, but not limited to:
 - A. Wiring from all control devices furnished to the respective equipment being controlled.
 - B. Furnishing and installation of all necessary conduit and wire.

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- C. Interlocking wiring between rooftop units, exhaust fans and radiation as specified in the sequence of operations, shown on the drawings or otherwise required.
 - D. Installation of smoke detectors and wiring to fan starter unless otherwise specified.
 - E. Wiring of flow switches, sequence relays, thermostats and permissive circuits to boilers.
7. Metal raceways shall be installed where pipe cannot be installed in construction and shall be stamped one-piece metal minimum 18-gauge, factory painted color selected and secured to prevent vandalism.
 8. In locations where wire cannot be installed above ceiling, wire shall be run in metal raceways.
 9. Except for motor feeders and for existing wiring between motors, motor controllers, feeder panels, fuses, circuits breakers and buss bars. All of the new electrical work required for the facility management control system including but not limited to time switches, damper motors, damper switches, electric thermostats, electric relays, interlocking wiring, wire, conduit, etc.; shall be provided and installed by the FMCS Contractor. It shall be the FMCS Contractor's responsibility to provide all wiring required to achieve the functions called for in these specifications.
 10. All exposed wiring shall be in EMT or rigid conduit.
 11. Control wiring in plenums shall be furnished and installed in EMT or conduit or an approved shielded cable for plenum use above accessible ceiling spaces.
 12. DDC contractor shall provide all wiring. Where union jurisdiction (110V and above) prohibits installation by Contractor, the contractor shall provide the services of a licensed electrical contractor. Contractor may be same contractor as on job, or a different electrical contractor. All costs for providing this work shall be the mechanical contractors' responsibility.

3.02 INSTALLATION OF DAMPER MOTORS

2. Where damper motors are provided by equipment manufacturer, they shall be completely integrated with the ATC system. The contractor is responsible for all coordination of work not in accordance with above at no extra cost to Owner.

3.03 DAMPER AND CONTROL DEVICE LOCATION AND ACCESSIBILITY

1. All control equipment requiring service or adjustment located above suspended acoustical ceiling shall have their locations permanently marked on ceiling. Markings shall consist of a color scheme. The markings shall be permanently applied to surface with legend and location agreed to and provided to Owner. Provide in addition to chart, a permanently mounted graphic display as to locations of the devices.
2. All devices shall be located to be accessible and easily maintained and if found inaccessible, shall be relocated by Contractor at no additional expense to Owner, regardless of the trades involved.
3. Where devices are behind general construction, provide access doors.

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3.04 ATC PANELS

1. The location and quantity of ATC panels are to be determined and verified in field. Panels to have emergency power electrical connections. The final location and quantity of panels are to be verified with Owner. Contractor shall be responsible for providing all power wiring and to coordinate all power wiring requirements as to location, quantity, and wire size with electrical contractor. Extension of services, new power wiring for new panels, and all modifications to existing panels which affect electrical contractor shall be the responsibility of the ATC contractor.
2. All ATC panels, controllers, and equipment that require continuous uninterrupted power supply are to remain in operation and shall have battery and/or UPS back-up provided by Contractor. The back-up shall be for a minimum of 3 hours and shall allow for an orderly shutdown. The resetting, rescheduling, and/or reprogramming of the controls will not be allowed based upon failure to meet the intent of this specification.
3. No unit controllers or ATC panels shall be located above the ceiling.

3.05 ACCEPTANCE TESTING

1. Upon completion of the installation, the Contractor shall load all system software and start-up the system. Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.
2. Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
3. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in the presence of Owner's representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
4. System Acceptance: Satisfactory completion is when Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.
5. Commissioning: Contractor shall complete and provide to the CM and Cx all factory start-up reports and pre-functional documentation. Contractor shall have the project lead technician attend all Cx meetings. Contractor shall coordinate with and support the Owners' testing and balancing contractor.

3.06 EXISTING CONTROLS

1. The following is equipment, in addition to equipment shown on drawings, which will require the existing controls to be modified for connection and interface to new DDC system. The equipment is indicated below for the various portions of the building.

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- Existing Steam Boiler
- Existing Steam Converter
- Existing Pumps
- Existing Gymnasium Rooftop Unit

3.07 ROOFTOP UNIT DEHUMIDIFICATION CYCLE

1. Upon a rise above setpoint of room humidistat and unit in cooling occupied mode; energize units' hot gas reheat cycle and close outside air damper. Whenever outside relative humidity is higher than inside outside, air damper shall remain closed for minimum of 1 hour. After that time, CO2 sensor shall allow damper to be cycled between open and closed based on indoor humidity. Upon a continued rise above space humidity sensor and a fall below space temperature and hot water is available; modulate hot water valve heat coil to maintain room temperature. Upon a rise above setpoint, the reverse shall occur.

3.08 SUMMER DEHUMIDIFICATION CYCLE

1. Upon a requirement for dehumidification in summer (cooling cycle) and space relative humidity is above outside air humidity as sensed by either rooftop units, unit ventilators (minimum 25% of total unit ventilators or by manual selection; the following shall occur.
 - A. Energize one boiler and maintain 100°F. +/- (adj.) (final temperature per boiler manufacturer).
 - B. Primary pump energized, and secondary pump energized. Pump speed controlled per field setting and pressure differential.
 - C. All control valves on all equipment not required for humidity control (ie. Radiation, unit and cabinet heaters, coils, etc.) shall be closed.
 - D. Maintain 100°F. loop temperature.
 - E. Allow pumps and boilers to be operated for minimum selected times, initially 4 hours. After that period and no dehumidification requirements, the system shall be deenergized.

PART 4 HARDWARE POINTS

4.01 GENERAL

1. The Facility Management and Control System (FMCS) shall be designed, installed, and commissioned in a turnkey fully implemented and operational manner, including all installation labor and programming.

4.02 HARDWARE POINTS LIST - I/O Points by the FMCS Contractor

1. Heating Plant
 - Outside Air Temperature
 - Pressure Differential Hot Water Supply & Return (2)

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- VFD Drive Operation (2 Pumps)
- Hot Water Supply/Return Temperature (Monitor/Adjustment) (4)
- Primary Pump Failure (2)
- Interface to Boiler Control Module

2. Pumps

- Pressure Differential Water Supply & Return
- VFD Drive Operation
- Pump Status
- Pumps Failure
- VFD Adjustment
- VFD Setting

3. Packaged VAV Rooftop Unit

- Supply Fan Start/Stop
- Supply Fan and adjustment Exhaust Fan (where applicable) VFD Status (0% to 100% of maximum setpoint)
- Alarm State
- Exhaust/Return Fan Start/Stop (If Applicable)
- Supply Fan Status
- Supply Duct Static Pressure
- Exhaust/Return Fan Status (If Applicable)
- Outside Air Temperature/Humidity
- Return Air Temperature/Humidity
- Mixed Air Temperature/Humidity
- Discharge Air Temperature
- Return CO₂ (U.N.O. setpoint to be 700 PPM above ambient)
- Economizer Command
- Heating Demand (modulating gas heat control)
- Stage 1 Cooling (Where Applicable)
- Stage 2 Cooling (Where Applicable)
- Return Air Smoke Detector

4. VAV Boxes - I/O Points by the FMCS Contractor

- Supply Air Temperature
- Supply Air Volume (CFM)
- Space Temperature
- Adjustment Room Temperature
- Adjustment Primary Air Volume (CFM)
- Room CO₂ (ppm)
- Control Valve Operation (water reheat units only)
- Fin Tube Control Valve (for spaces with VAV box)

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PART 5A SEQUENCE – GENERAL

SPACE SETPOINTS

	SPACE SETPOINT
Occupied Heating	68°F.
Morning Warm-up	68°F.
Unoccupied Heating	60°F.
Occupied Cooling	74°F.
Cool-down	74°F.
Unoccupied Cooling	80°F.
Relative Humidity	55% RH

Note: All setpoints to be adjustable by Owner via FMCS.

OCCUPIED/UNOCCUPIED PERIODS

The purpose of this schedule is to establish a base line for equipment operation and sequencing. This is to allow system to provide optimum effectiveness and increase efficiency. The hours of operation shall be reviewed with the school prior to occupancy. The contractor shall provide as part of their training, instructions to Owner for changing and adjusting sequences and times of operation. The hours of operation shall also be able to be adjusted for individual equipment and/or zones (ie. Gymnasium, Auditorium).

Occupied Heating 6AM

Optimal start-up with adjustment based on system requirements.

Occupied Heating (Outside Air)

Operation of outside air system (damper open, heat recovery outside air) delayed approximately one hour after occupancy (adj.) and one hour prior to end of school (adj.).

Unoccupied Heating 3PM

Schedule for after school usage shall adjust this period.

Occupied Cooling 7AM

Optimal smart start-up with adjustment based on system requirements.

Occupied Cooling (Outside Air)

Operation of outside air system (damper open, heat recovery outside air) delayed approximately one hour after occupancy (adj.) and one hour prior to end of school (adj.).

In addition, where CO2 sensor below operational setpoint and outside relative humidity is higher, adjust damper opening time to allow for delayed opening.

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Unoccupied Cooling 3PM

Schedule for after school usage shall adjust this period.

PART 5B – SEQUENCE OF OPERATIONS

5.01 FANS

1. Ventilation Fans - Provide timer switch to energize fan whenever its setting is exceeded and open automatic damper on intake (where applicable).
2. Single Toilet Rooms Exhaust Fans - Ceiling exhaust to operate with light switch. (Note- Contractor to provide all interlocking controls and control wiring).

5.02 UNIT HEATERS, CONVECTORS AND CABINET UNIT HEATERS

1. Provide wall mounted thermostats which shall start fans and open valves on heating coils, whenever space temperature falls below set point. Aquastat shall sense availability of hot water.

5.03 RADIATION

1. Classroom room sensor shall, thru DDC system, modulate control valve on radiation, reset temperature during unoccupied mode.
2. Where radiation is used for primary and/or supplemental heat and not interfaced with rooftop, VAV box or central units. Provide wall thermostat to modulate valve (not connected to DDC).
3. Note - Radiation is always first source of heat for all modes.

5.04 HVAC SYSTEM EMERGENCY SHUT-DOWN SWITCH'S

1. Upon manual operation of single switch, shut down all HVAC equipment that uses outside air for ventilation, combustion air or any other purpose which may cause outside air to enter building by equipment use.
2. Switch shall be for all equipment.
3. Switch shall be a manual switch labeled and lockable and shall be located per Owners' direction.
4. Switch shall also send signal for quick closing outside air dampers to close.
5. Provide clear plastic liftable cover and a 12" x 4" engraved sign; "Emergency HVAC Shut Down."

5.05 ROOFTOP UNITS - VAV

1. The units shall be sequenced from occupied/unoccupied warm-up modes/cool-down modes.
2. Provide the ability to override the control and energize system to occupied mode. Provide ability to have more than one override. Record time used and time and date of override events.

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3. Heating Unoccupied Mode - When indexed to unoccupied mode by central computer or by manual override; all associated exhaust fans shall be de-energized, 100% return air, outside air damper shall be closed, VAV box heat energized, and VAV box sequenced to night heat. Upon a fall below night unoccupied space temperature as sensed by DDC system external zone sensors; radiation shall be 1st stage of heat (where available) and then VAV air control shall be 2nd stage, rooftop unit shall be energized. Modulate valve on hot water coil. Sequence hot water heat and sequence dampers on VAV unit to allow for flow.
4. Heating Warm-Up Mode - When indexed to occupied mode (warm-up cycle), outside air damper closed; associated external exhaust fans de-energized and radiation shall be 1st stage of heat (if available) and then hot water heating coil energized and supply fan ramped up to preset minimum supply air flow and 100% return air until building is satisfied as sensed by central return air sensor. VAV boxes shall be indexed to warm-up mode. VAV box primary dampers open and boxes under control of space sensor. Maintain mode until room sensors reach occupied heating setpoint, after which sequence to occupied heating mode.
5. Occupied Heating Mode - After warm-up is complete, the outside air dampers and supply air fan shall be allowed to operate. Outside air damper to be controlled from CO2 sensor after time delay in opening. Upon a rise above setpoint; open outside air damper from closed to minimum position. Discharge air set point shall be reset based on outdoor air temperature to a maximum of 62°F. (adj.). VAV boxes shall, upon a fall below setpoint, modulate primary dampers closed until minimum position, then first modulate hot water control valve on radiation and then modulate valve on VAV box reheat coil. Note – In milder weather, radiation shall be 2nd stage. Upon a rise to above 62°F. and economizer opened 100%; de-energize energy wheel. Disable Dx cooling for outdoor temperatures less than 62°F.
6. Cooling Unoccupied Mode - When indexed to unoccupied mode by central control or by manual override. All associated exhaust fans to be de-energized, relief and outside air dampers closed. VAV box de-energized and VAV sequenced to unoccupied mode cooling. Upon a rise above night sensor, unoccupied cooling space temperature as sensed by ATC system, external zone sensors and interior enthalpy is above outside exterior enthalpy, energize unit economizer system to 100% outside air and open relief air dampers to provide purge mode, open room VAV primary dampers. Provide purge mode until all zones have been satisfied. Provide time delay minimum 30-minute run time. Provide space low limit temperature and space high humidity thru DDC system shall override purge mode upon a fall below or rise above setpoint.
7. Cooling Occupied Mode - When indexed to cooling occupied mode from central computer, system shall first go to cool-down. Energize supply air fan. Close outside air dampers. Outside air damper to be controlled from CO2 sensor to open from closed to minimum position after time delay in opening. System shall either provide refrigeration or economizer operation. Discharge air temperature control shall maintain desired reset discharge air control which shall be based on return air temperature and outside air temperature fully adjustable summer 55°F. ± and winter 62°F. ±. Upon a fall below setpoint of discharge air control, modulate closed outside air damper and operate enthalpy economizer with refrigeration to maintain desired setpoint. Upon a continued fall below setpoint, de-energize refrigeration and operate enthalpy economizer cycle per manufacturers' requirements. Upon a continued fall below set point; reset outside air dampers to minimum. Upon a further fall below set point; go to occupied heating mode. Disable Dx cooling for outdoor temperatures below 55°F. (adj.).
8. Discharge Duct Static Pressure Setpoint - Duct pressure sensor located @ $\frac{3}{4}$ of the total duct length located shall maintain desired duct static pressure by modulating VFD drive on supply

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fan. The control bands, setpoint increment values, setpoint decrement values and adjustment frequencies shall be adjusted to maintain maximum static pressure optimization with stable system control and maximum comfort control.

9. Outside Air - The minimum outside air quantity shall remain constant during all modes regardless of supply air quantity, except for economizer operation and unoccupied cycles. To maintain compensated outdoor air control (1AQ), CO2 sensors shall reset minimum outside air quantities minimum based on return air CO2 levels, but outside air quantities shall not be allowed to fall below point where building is under negative pressure as sensed by pressure differential control between outdoors and indoors.

10. StartUp Purge Cycle

- A. The normal start up shall be as indicated above. The DDC system and unit control shall have a separate start up purge cycle which shall only be used if desired by Owner. The control logic sequence of operations shall be provided.
- B. The sequencing of the system from normal start up to purge cycle start up shall be automatically initiated. The DDC system shall, during the normal operation, track and trend the conditions at start up, and if determined after a period of normal operation, that a purge start up cycle is required, then the system shall initiate a purge condition. This shall also alert operation and allow for manual override. Purge cycle shall only be initiated under outside conditions where economizer operation allows for free cooling.
- C. When the unit starts, the outdoor air damper shall open and exhaust fan to track supply fan, initiating a timed purge cycle. The outdoor air damper shall modulate to maintain the mixed airflow at 30% outdoor air. The purge period shall be adjustable and shall initially be set for 30 minutes.
- D. The unit shall modulate its preheat control to maintain the discharge air temperature set point if the mixed air temperature falls below the AHU discharge air temperature falls below the unit discharge air temperature set point. At the conclusion of the timed cycle, the outdoor air damper shall modulate closed and exhaust fan speed reset to maintain the base ventilation rate of outdoor air, and the demand-controlled ventilation control algorithm shall be enabled.

11. Summer Occupied Mode

- A. When indexed by the school or as a scheduled event when there is minimum occupancy, energize one unit and open bypass duct and average the two (2) duct static pressure sensors. Discharge temperature shall be set to normal summer occupancy setting. De-energize 2nd unit and close all outside and relief air dampers. Provide a manual override for this mode that will de-energize unit when there is no occupancy as determined by manual control at HMI station.

12. Emergency Shutdown

- A. Close outside air dampers with 30 seconds of signal from DDC system.

13. Units shall be interfaced with VAV unit CO2 sensors to allow for either VAV unit on rooftop unit to control outside air quantity.

14. Normal Backup (where applicable)

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- A. In the event of a failure of one unit to provide required cooling or a mechanical issue or a manual override from control system, the following shall occur;
 1. Provide alarm condition.
 2. De-energize failed unit and outside and relief dampers closed.
 3. Open bypass dampers in supply and return.
 4. Allow discharge air duct sensors to average signal to active unit fan speed control.
 5. Reset discharge air temperature lower, summer 50°F. ±.
 6. Reduce VAV box operation of affected unit 50% +/- adj.

5.06 VAV UNITS

1. Refer to Sequence in Part 5.05. Where there is radiation, VAV box shall be coordinated with radiation operation to prevent overheating.
2. Minimum air quantities shall be heating 40%, cooling mode 15% (adj.). Contractor shall include as part of his bid, adjustment of minimum air quantities after initial settings based on space and comfort conditions.
3. Each VAV zone controller shall monitor primary air flow, space temperature, air handler status and mode, supply air temperature and shall position its terminal damper-based unit's (PID) temperature control algorithm to maintain the desired zone temperature set point. Each zone controller shall include the inherent ability to override the temperature control loop and modulate the terminal's damper with (PI) loop. The zone controller shall be capable of maintaining a ventilation set point through a demand-controlled ventilation (DCV) algorithm in conjunction with the unit to fulfill the requirements of ASHRAE standard, 62-189 "Ventilation for Acceptable Indoor Air Quality" and 2015 IMC.
4. Whenever the system unit is operating in occupied mode, the system controller shall maintain the base ventilation rate, unless overridden by a pre-occupancy purge sequence or the DCV function.
5. The system controller shall modulate the preheat control to maintain the discharge air temperature setpoint if the mixed air temperature falls below the discharge air temperature setpoint. The zone controller shall contain a provision to operate modulating type heat to maintain the space temperature at the midpoint between the heating and cooling setpoints during DCV operation.
6. Operation shall be dependent upon the equipment mode of operation, so that the DCV function will only operate during occupied periods when the outdoor air damper is actively providing ventilation. DCV control shall be disabled if the CO₂ sensor fails.

5.07 COVID OPERATION

1. For all units, provide a 2-hour (adj.) occupying and post occupancy mode which shall allow for units to run @ 100% outside air.
2. Control of units (to prevent excess humidity, high and/or low temperature) shall be per purge mode sequence, except that there shall be an external manual override. When manual override is energized upon a rise above room humidity setpoint, low/or high temperatures shall initiate alarm condition.

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3. System shall have outside air dampers open override control for CO2. Minimum setting shall be adjustable. When CO2 sensor override is energized upon a rise above room humidity setpoint, low/or high temperatures shall initiate alarm condition.
4. When indexed pre-purge, post-purge mode by central control or by manual override, system shall go to 100% outside air, open VAV primary dampers. Provide purge mode for indicated period. Provide time delay minimum 30-minute run time. Provide space low limit temperature and space high humidity thru DDC system shall override purge mode upon a fall below or rise above setpoint and reduce outside air damper until fall below setpoint.
5. Startup Purge Cycle
 - A. The normal start up shall be as indicated above. The DDC system and unit control shall have a separate start up purge cycle which shall only be used if desired by Owner. The control logic sequence of operations shall be provided.
 - B. The sequencing of the system from normal start up to purge cycle start up shall be automatically initiated. The DDC system shall, during the normal operation, track and trend the conditions at start up, and if determined after a period of normal operation, that a purge start up cycle is required, then the system shall initiate a purge condition. This shall also alert operation and allow for manual override. Purge cycle shall only be initiated under outside conditions where economizer operation allows for free cooling.
 - C. When the unit starts, the outdoor air damper shall open and exhaust fan to track supply fan, initiating a timed purge cycle. The outdoor air damper shall modulate to maintain the mixed airflow at 30% outdoor air. The purge period shall be adjustable and shall initially be set for 30 minutes.
 - D. The unit shall modulate its preheat control to maintain the discharge air temperature set point if the mixed air temperature falls below the AHU discharge air temperature set point. At the conclusion of the timed cycle, the outdoor air damper shall modulate closed and exhaust fan speed reset to maintain the base ventilation rate of outdoor air, and the demand-controlled ventilation control algorithm shall be enabled.

5.08 NEW BOILER

1. Provide boiler manufacturer supplied boiler control panel to control each boiler operation in sequence. On a call for lead boiler operation, operate the combustion air system and provide same prior to boiler operation. Upon a continued drop, energize third boiler. Automatically sequence the boilers on and off and modulate the respective burners in sequential order, in accordance with the above parameters and determined by the lead/lag selector and boiler manufacturer.
2. A flow switch in the header from each boiler shall prevent operation unless flow is present.
3. Provide factory mounted boiler control, interface with DDC system. Provide signals and input and output to DDC system.
4. Existing steam boiler to remain and have new DDC controls. Existing steam converter to remain and provide new interface to existing steam converter to allow for existing steam converter to be used for backup for new hot water boiler. In backup mode, upon a need for heat from the

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existing converter for new system, the existing boiler shall be energized, and the existing converter be energized. The water temperature to the new system shall be maintained at the desired temperature. (water temperature shall be for both dehumidification and normal heat).
Note – The reverse shall be the normal operation where new boiler is used as new source of heat.
Provide selector switch.

5.09 HOT WATER HEATING SYSTEM SUMMER DEHUMIDIFICATION

1. To provide for the existing system to have capability for summer dehumidification, the following shall be provided:
 - A. Upon indexed from central computer or manual control delivered to the system, the field determined water temperature shall be maintained at 100° F. - 120° F. +/- (adj.).
 - B. All equipment not requiring hot water for reheat shall have control valve closed. Valves on radiation and cabinet heater indexed to close and turn off all unit heater and cabinet fan motors and radiation. This shall be accomplished either thru DDC system or by use of strap on aquastat.
 - C. Main hot water pumps to be modulated to lower speed. Exact setting to be field verified.
 - D. Sequence new high efficiency boilers thru boiler controls.

5.10 HOT WATER HEATING PUMP CONTROL

1. Main circulating pumps shall be energized at 60°F (adj.) and below outside air temperature. Variable frequency drives shall adjust speed of pumps based on differential pressure between supply and return main piping. Provide automatic alternator and lead/lag control which shall alternate operation of lead pump and upon failure of first (lead pump) as sensed by flow control, initiate alarm condition and start 2nd pump. Provide all graphics and controls. During night setback mode, hot water pumps shall run.
2. Primary pumps for boilers shall be interlocked with boiler served by pumps. Pumps to run only upon a requirement for heat for that boiler.

END OF SECTION
15930.6362

SECTION 15995 – MECHANICAL: FACILITY STARTUP/COMMISSIONING

PART 1-GENERAL

1.01 SCOPE OF THE WORK

- 1. The purpose of this section is to specify Division 15 responsibilities and participation in the commissioning process. See Section 01650 for a detailed list of the responsibilities of all parties.
- 2. Commissioning is the responsibility of Contractor (including subcontractors and vendors), the Owner, the Owner’s Commissioning Agent, the Design Professional and the Construction Manager. The attached “Commissioning Responsibility Matrix” in Section 01650 lists the responsibilities for various parties involved in Commissioning. Parties having primary responsibility are identified with a “1”; parties having secondary (or support) responsibility are identified with a “2”. The commissioning process requires Division 15 participation to ensure all portions of the work have been completed in a satisfactory and fully operational manner.
- 3. Work of Division 15 includes:
 - A. Start-Up and testing of the mechanical equipment and systems.
 - B. Pre-balancing, testing, adjusting, and balancing.
 - C. Operating equipment and systems as required for commissioning tests.
 - E. Providing qualified personnel for participation in commissioning.
 - F. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process, which fulfill contract warranty requirements.
 - G. Providing equipment submittals, operation and maintenance information and as-built drawings.
 - H. Providing training for the systems specified in this Division.
 - I. Coordinating all other Division 15 work with the Commissioning schedule.

1.02 RELATED WORK

- 1. All start-up and testing procedures and documentation requirements specified within Division 15.
- 2. **Contractor shall cooperate with the Commissioning Agent in the following manner:**
 - A. Allow sufficient time before final commissioning dates so that testing, adjusting and balancing can be accomplished.
 - B. Put all heating, ventilating, and air conditioning equipment and systems into full operation and continue the operation during each working day of testing, adjusting and balancing and commissioning.
 - C. Provide labor and material to make corrections when required, without undue delay.
 - D. Provide test holes in ducts and plenums where directed or necessary for pitot tubes to take air measurements and to balance the air systems. Test holes shall be provided with an approved removable plug or seal. At each location where ducts or plenums are insulated, test holes shall be provided with an approved extension with plug fitting per NEEB and AABC requirements.

SECTION 15995 – MECHANICAL: FACILITY STARTUP/COMMISSIONING

- E. Provide pressure and temperature taps as indicated on construction documents in locations as required by the TAB firms to adequately test and/or balance the hydronic systems.
- F. The contractor is responsible for testing, adjusting and balancing (TAB).

PART 2- EXECUTION

2.01 WORK PRIOR TO COMMISSIONING

1. Contractor shall complete all phases of work so the system can be started, tested, adjusted, balanced, and otherwise commissioned. Contractor has primary start-up responsibilities with obligations to complete systems, including all sub-systems so they are fully functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.
2. A commissioning plan will be developed by the Owner's Commissioning Agent with input from mechanical contractor. Contractor shall assist in the preparation of the commissioning plan by providing necessary information pertaining to the actual equipment and installation. Equipment modifications made in order to meet contractual performance requirements will be made at no additional cost to the Owner.
3. Specific pre-commissioning responsibilities within Division 15 are as follows:
 - A. Factory startup services for the following items, but not limited to, equipment (as specified throughout Division 15) and as indicated below:
 - HVAC equipment
 - Heating equipment
 - Exhaust systems
 - Direct expansion cooling systems
 - Pumps
 - Boilers
 - Building management systems
 - Make-up air equipment
 - B. Manufacturers' field startup services required to bring each system into a fully operational state. This includes; cleaning, filling, purging, leak testing, motor rotation check, control sequences of operation, full and part load performance, etc. Division 15 contractor shall submit manufacturer's field startup procedures for review by the Design Professional and Commissioning Agent.

2.02 PARTICIPATION IN COMMISSIONING

1. Contractor shall provide skilled technicians to start up all systems within Division 15. These same technicians shall be made available to assist the Owner's Commissioning Agent in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested and coordinated by Contractor. Division 15 contractor(s) will ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustment, and/or problem resolutions.

SECTION 15995 – MECHANICAL: FACILITY STARTUP/COMMISSIONING

2. System problems and discrepancies may require additional technician time. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained at no additional cost to Owner.
3. Before system start-up begins, conduct a final installation verification audit. Contractor shall be responsible for completion of all work including change orders and punch list items to the satisfaction of the Owner's Commissioning Agent and/or construction manager. The audit shall include, but not be limited to, a check of:
 - Piping specialties including balance, control, and isolation valves.
 - Ductwork specialty items including turning devices; balance, fire, smoke and control dampers; and access doors.
 - Control sensor types and locations
 - Identification of piping, valves, starters, gauges, and thermometers, etc.
 - Documentation of prestart-up test performed, including manufacturer's factory tests.
 - Accessibility to equipment in 1-3 above.
4. If any work is found to be incomplete, inaccessible, incorrect, or non-functional, make note of deficiencies and correct deficiencies before system start-up work proceeds.

2.03 WORK TO RESOLVE DEFICIENCIES

1. In some systems, maladjustments, misapplied equipment and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work will be completed under the direction of the Owner's commissioning agent and the design professional. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the design professional will have final jurisdiction on the necessary work to be done to achieve performance.
2. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance will be permitted.

2.04 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

1. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed regardless of the season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons. Commissioning under conditions representing other than the current season, may be undertaken at a later time by the Owner's commissioning agent wherein the contractor will be expected to participate. Discrepancies discovered with the contractor's equipment or workmanship will be handled as warranty items.
2. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Cooling equipment will be tested during summer design extremes, with a fully occupied building. Mechanical contractor and each supplier will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance; as scheduled by Contractor, with three-day (minimum) advance notification.

SECTION 15995 – MECHANICAL: FACILITY STARTUP/COMMISSIONING

3. Commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. Contractor will be responsible for participating in the occupancy sensitive testing of systems to provide verification of adequate performance. If such occupancy is not available within the contract period related commissioning may be undertaken at a later time by the Owner's Commissioning Agent, wherein Contractor will be expected to participate. Discrepancies discovered with Contractor's equipment or workmanship will be handled as warranty items.

2.05 RETESTING AND RECOMMISSIONING

1. Any fault in material or in any part of the installation revealed by the commissioning test shall be investigated, replaced or repaired by Contractor and the same test repeated at Contractor's expense until no faults appears.

2.06 TRAINING

1. Participate in the training of the owner's staff, as required in Divisions 1 and 15, on each system and related components. Mechanical contractor shall provide a training syllabus for review by the Owner's commissioning agent and the design professional.
2. Training will be conducted jointly by Contractor, the design engineers, and the equipment vendors. Contractor will be responsible for highlighting system peculiarities specific to this project.

2.07 SYSTEMS DOCUMENTATION

1. Refer to "as-built" documentation requirements in Divisions 1 and 15. Continuous and regular red-lining of drawings is considered essential and mandatory.

2.08 MISCELLANEOUS SUPPORT

1. Division 15 contractor(s) shall remove and replace covers of mechanical equipment, open access panels, etc., to permit the Owners' commissioning agent to observe equipment and controllers provided. Furnish ladders and flashlights as necessary.

END OF SECTION
15995.6362

SECTION 15015 – GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

1. The General, Supplementary, and Special Conditions, Applicable portions of all divisions and the addenda thereto, are made a part of this Contract.
2. All work described in these specifications shall be the responsibility of the plumbing contractor unless otherwise indicated.
3. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole.

1.02 CONTRACT DRAWINGS

1. Examine all drawings and specifications and visit the site to become acquainted with the construction and the extent of the work.
2. In referring to drawings, figured dimensions take precedence over scale measurements. Discrepancies must be referred to the Engineer for decision. Each Contractor shall certify and verify all dimensions before ordering material or commencing work.
3. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, shall be furnished as though called for in both.
4. When any device or part of equipment is herein referred to as a singular number, such as "the pump" such reference shall be deemed to apply to as many such devices as required to complete the installation.
5. The term "provide" shall mean "furnish and install". Neither term will be used generally in these specifications but will be assumed. The term "furnish" shall mean to obtain and deliver on the job for installation by other trades.

1.03 CODES AND STANDARDS

1. All work shall comply with all regulations and be subject to inspection and approval of authorities having jurisdiction.
2. Where items indicated on contract documents differ from code requirements, Contractor shall inform engineer prior to installation. Any construction installed by Contractor that is not in compliance with applicable codes, shall be removed, modified, and/or replaced at not additional cost.
3. All equipment shall be labeled by an approved agency.
4. Contractor shall give all notices, obtain and pay for all permits, deposits, and fees necessary.
5. Manufacturer's published data is made a part of these specifications.

SECTION 15015 – GENERAL REQUIREMENTS

6. Wherever a recognized national organization has published standards these shall be complied with (such as ASA Z 21.30 for gas piping).
- 1.04 REJECTED MATERIALS
1. See Specification Section 01300-Submittals and the AIA Document A201-2017 General Conditions of the Contract for Construction.
- 1.05 WORKMANSHIP
1. See Specification Section AIA Document A201-2017 General Conditions of the Contract for Construction.
- 1.06 SHOP DRAWINGS
1. See Specification Section 01300 – Submittals.
- 1.07 AS-BUILT DRAWINGS
1. See Specification Section 01700 – Project Closeout
- 1.08 WARRANTY
1. See Specification Section 01740 – Warranties and Bonds.
- 1.09 FIRE RATING
1. All materials used anywhere in the work must have N.F.P.A. rating as follows:
 - A. Flame Spread - Not Over 25
 - B. Smoke Developed - Not Over 50
 - C. Fuel Contributed - Not Over 25
 2. All materials shall be "Self Extinguishing".
- 1.10 MAINTENANCE SERVICE
1. Contractor shall furnish complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for two (2) years from Date of Substantial Completion as determined by Architect.
 2. Provide scheduled maintenance service with three (3) month interval as maximum time period between scheduled service or as indicated elsewhere (applicable only if less than 3-month intervals).
 3. Provide 24-hour emergency service on breakdowns and malfunctions.
 4. Include maintenance items as outlined in manufacturer's operating and maintenance data.

SECTION 15015 – GENERAL REQUIREMENTS

5. Submit copy of service call work order or report and include description of work performed. Handwritten report acceptable at time of service. Type written report to be provided to Owners' maintenance staff within two (2) weeks of service call.
6. See Section 15930 for additional requirements for control system.

1.11 EQUIPMENT DEVIATIONS

1. The material and products mentioned in these specifications are given to establish a standard of quality, design and performance. The phrases "equivalent", "acceptable", "or approved equal" and "equivalent to" shall be used to indicate that other similar products may be used and provided in accordance with "General Conditions", where applicable, such substitutes are accepted by the Architect as meeting all standards necessary to perform the function intended.
2. Where Contractor proposes to use equipment other than that specified or detailed on drawings, which will require any changes of the structure, partitions, foundations, piping, wiring or any other part of the design documents; all design, engineering and any new coordination drawings and detailing required by other contractors and/or professionals shall be paid by Contractor at no additional cost to Owner.
3. Where such deviations from equipment specified and/or indicated on plans, require a different quantity and/or arrangement of any duct work, piping, electrical work, wiring conduit and/or equipment that would have been required for equipment. Contractor shall with the approval of the Architect provide all material, equipment and labor required by the change at no additional cost to the Owner.
4. Where such approved deviation requires a change to the structure, electrical, plumbing or any other Contractor's or Sub-Contractor's work, or any change to the construction as indicated on the design documents. Contractor shall pay for all costs incurred due to such deviations at no additional cost to the Owner.

1.12 EQUIPMENT SELECTION AND SERVICEABILITY

1. All equipment shall be located and installed so that it may be serviced. Demonstrate that there is room to remove all tube bundles, motor and similar equipment. Equipment which is too large or poorly located to permit servicing shall be replaced or repositioned at no additional cost to the Owner.
2. Where piping or control diagrams or sequencing differ from the recommended piping arrangements of the equipment manufacturer, and will directly affect the equipment performance, the manufacturer's recommendations shall be submitted in writing to the Architect/Engineer for approval, prior to purchasing the equipment involved. Contractor shall be responsible for obtaining such recommendations from the manufacturers in order to effect correct and perfect operation of the equipment at the capacities and temperatures indicated.

1.13 EQUIPMENT FURNISHED BY OTHER TRADES

1. All equipment furnished and/of installed by other trades requiring connections and services by Contractor shall have such services provided.

SECTION 15015 – GENERAL REQUIREMENTS

2. Contractor shall verify exact requirements with shop drawings.
3. Contractor shall verify all locations, sizes, requirements of services required for equipment in field with Contractor furnishing equipment.

1.14 FIRE SAFING

1. Provide fire safing and duct safing per 2018 IBC New Jersey edition. Proseal Systems - Proseal plug device per 93 UL Directory, No 545, F rating for precast concrete. 3M Brand Fire Barrier CP25WB and caulk CAJ 1044 and CAJ 5001, WL1003, WL5011, or approved equal.

PART 2 PRODUCTS

2.01 ELECTRICAL EQUIPMENT

1. Contractor shall furnish all his equipment complete with motor, controllers, capacitors and starting equipment.
2. Electric motors shall be open, drip proof induction motors rated for continuous duty at 15% overload with 40° C. rise; single phase motor shall be capacitor start-induction run. Motors one-half horsepower shall be single phase, unless otherwise noted (c.f. Division 16). Starting of magnetic across-the line starters equivalent to Furnas Bulletin 14 or approved equal, unless otherwise specified. Thermal overload type, motor rated manual switches shall be furnished for motors ¾ HP and less which do not require magnetic starters for control purposes.
3. Provide FPE/CDE Type 1C Power Factor correction capacitors size to increase full load power factor to 95%. Capacitors shall be fused, in NEMA enclosure, connected between safety switch and motor starter.
4. Where apparatus is specified as "Packaged", all electrical equipment shall be furnished, set and wired to a single point of connection for apparatus as a unit.
5. Contractor shall set all electrical equipment furnished by him unless same is to be mounted on an electrical panel board, junction box or similar piece of electrical equipment and is to be wired by others.
6. Where electrical characteristics are not shown, all electrical characteristics shall be as indicated on electrical plans. Where there is a conflict between model numbers which indicate electrical characteristics and electrical drawings, the electrical drawings shall take precedent.
7. Contractor shall verify all electrical characteristics of all equipment with electrical contractor. Contractor shall submit to electrical contractor location of all motor, starters, other electrical equipment voltage and phase required prior to submission of Contractors' and electrical contractors' shop drawings.
8. Should Contractor change type of equipment which results in change to electrical characteristics, then Contractor will be responsible to coordinate these changes with all other trades and pay for all required changes.

SECTION 15015 – GENERAL REQUIREMENTS

9. Should Contractor change electrical characteristics of equipment from that shown on electrical drawings, he is responsible for any extra cost resulting from such change.

2.02 ELECTRICAL WIRING

1. Contractor shall furnish and install all electric wiring required for his contract, with the exception of certain wiring shown under Division 16.

2.03 RELIEF VALVES

1. Provide ASME labeled relief valve on each closed fluid system, set to relieve full code capacity at design pressure. Pipe discharge to closed drain or approved receptor.

2.04 THERMOMETERS

1. Thermometers shall be 5" diameter dial type with stainless steel cases and separate wells. Ashcroft T-7173T or approved equal, adjustable to any angle.

2.05 TAGS

1. Contractor shall provide a 2" diameter brass tag with stamped service designation and numbers, fastened to each valve with brass chain and "S" hook.
2. Each control, starter, disconnect switch, etc., shall be provided with 3/4" x 2 1/2" metal name tag securely fastened to device.
3. Omit name tags on controls exposed in finished spaces.

PART 3 EXECUTION

3.01 METHOD OF PROCEDURE

1. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the system.
2. Installation, connection and interconnection of all components of these systems shall be complete and made in accordance with the manufacturer's instructions and best trade practices. Contractor shall erect all parts of equipment to be furnished by him under his Contract at such time and in such manner as not to delay or interfere with other Contractors.
3. Contractor shall lay out his work and be responsible for the establishment of heights, grades, etc., for all interior and exterior piping, drains, fixtures, conduit, etc., included in Contract Documents, in strict accordance with the intent expressed thereby; and all the physical conditions to be met at the building and finished grade, and shall be responsible for accuracy thereof. The establishment of the location of all work shall be performed in consideration of the finished work. In case of conflict, equipment and/or materials shall be relocated without cost to the Owner, as directed by the Architect, regardless of which equipment was installed first.

SECTION 15015 – GENERAL REQUIREMENTS

4. Contractor shall cooperate with other contractors for the proper securing and anchoring of all work included within these specifications. Extraordinary care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other trades, as Contractor will be held financially responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.
5. Do not run pipe or conduit for plumbing systems in any concrete slab 3" or less in thickness. Do not place any pipe or conduit in any slab where the outside diameter of the pipe or conduit is more than one-quarter the thickness of the slab.
6. All piping, conduit and other plumbing materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.
7. Items such as valves, cleanouts, etc., that will be concealed in construction shall be installed and so arranged as to be fully accessible for adjustment, service and maintenance.

3.02 VISIT TO SITE

1. Due to the nature of the work involved under this Contract, all bidders are strongly encouraged to thoroughly examine the site. Bidding contractors are encouraged to thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of this Contract.
2. If discrepancies are noted between requirements of Contract Documents and existing conditions, Contractor shall so indicate to architect during bidding period and receive clarification before bidding. Failure to comply with this requirement will result in Architect's interpretation during the construction period and architect's decision will be final and binding as the sole interpreter of the Contract requirements.
3. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing structures.

3.03 CLEANING

1. Upon completion of the work, Contractor shall remove all excess material, debris, tools and equipment from the site, and leave the premises in a broom clean condition.
2. Flush out all piping systems with proper solvents to ensure removal of all foreign materials. Clean fixtures, equipment, piping and other surfaces soiled by the work. Remove debris and rubbish on a daily basis.

3.04 STARTUP AND ADJUSTMENTS

1. After all testing is complete, start each system and make final adjustments for proper flow, temperature and quietness of operation. Record all final results including flows, balance settings, temperature adjustments, pertinent notes and recommendations. Furnish copies of report for review and record.

SECTION 15015 – GENERAL REQUIREMENTS

2. Report shall show actual data as recorded. Variations are expected due both to "normal" variations in field readings and to settings deliberately made to achieve proper operating conditions rather than design guidelines. Correct operation and maintained conditions will be sufficient evidence of proper setting.

3.05 OPERATING AND MAINTENANCE INSTRUCTIONS

1. Contractor shall prepare complete sets of bound operating and maintenance instructions including valve chart framed under glass or laminated with clear plastic mounted on masonite board, indicating number, location and purpose of each valve. Two (2) charts and one (1) mylar copy shall be provided for each mechanical room or as designated. The instructions prepared shall be black on white and shall be complete enough so that men generally familiar with the type of system will need no further data to properly perform the indicated procedures.
2. Contractor shall furnish qualified personnel to instruct the Owner in the operation of the system and must request from the Owner, in writing, a date for such instruction to begin. Contractors' personnel shall remain until such instruction is complete to Owner's satisfaction. Contractor shall receive from Owner written verification that the Owners personnel have been thoroughly instructed in the operation, maintenance and all facets of the system operation.
3. Manuals shall include all equipment, equipment parts lists, complete oiling, recommend spare parts, complete coiling, cleaning and servicing data compiled in a clearly indexed and easily understood form the data shall indicate the serial numbers of each piece of equipment and provide complete lists of replacement parts motor parts ratings and actual loads.
4. Provide operating instructions shall include wiring and control diagrams showing complete layout of each system.
5. Any special emergency operating instructions and a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.
6. ASME and State pressure vessel inspection forms, all motor data, including standard and actual operating in service data and copies of all manufacturer's equipment, guarantees and warranties.
7. Provide separate manuals, reports, instructions, etc. for each school.

3.06 PAINTING AND FINISHING

1. All painting is to be done in accordance to Rust-Oleum Corporations or approved equal printed instructions. All surfaces to receive two (2) coats of primer, exposed surfaces one (1) finished coat. Aluminum or galvanized metal surfaces are considered finished where concealed.
2. All surfaces to be carefully cleaned and/or pickled and filled as required to provide a proper uniform surface. Factory finished equipment shall be touched up or refinished where required.

3.07 CONSTRUCTION SAFETY

1. All work shall be done in accordance with the following Federal regulations:

SECTION 15015 – GENERAL REQUIREMENTS

- A. Williams-Steiger Occupational Safety and Health Standards, Chapter XVII of Title 29, Codes of Federal Regulations.

2. Comply with local Health and Safety Regulations.

3.08 ENERGY CONSERVATION CODES

1. It is the intent of this specification that all equipment and materials furnished meet the latest enforced edition of the Energy Code or such code as locally applicable, if more restrictive.

3.09 FLASHINGS

1. All piping passing through roofs shall be provided with Stoneman "Stormtite" seamless lead flashing (or approved equal).

3.10 DELIVERY AND STORAGE OF EQUIPMENT

1. Contractor shall store, take deliveries and install all equipment in accordance with manufacturers requirements. (see general conditions)

3.11 STERILIZATION

1. After final testing for leaks, all new potable water lines shall be thoroughly flushed, by plumbing contractor, to remove foreign material. Before placing the system in service, Contractor shall engage a qualified service organization to sterilize the new water lines in accordance with the following procedure:
 - A. Through a ¾" hose connection in the main entering the building, pump in sufficient sodium hypochlorite to produce a free available chlorine residual of not less than 100 ppm.
 - B. Proceed upstream from the point of chlorine application opening all faucets and taps until chlorine is detected. Close faucets and taps when chlorine is evident.
 - C. When chlorinated water has been brought to every faucet and tap with a minimum concentration of 100 ppm chlorine, retain this water in the system for at least two (2) hours.
 - D. At the end of the retention period, no less than 10 ppm of chlorine shall be present at the extreme end of the system.
 - E. Proceed to open all faucets and taps and thoroughly flush all new lines until the chlorine residual in the water is less than 1.0 ppm.
 - F. Obtain representative water samples from the system for analysis by a recognized Bacteriological Laboratory.
 - G. If all samples tested for coliform organisms are negative, a letter and laboratory reports shall be submitted by the service organization to the Contractor, certifying successful completion of the sterilization.

SECTION 15015 – GENERAL REQUIREMENTS

- H. If any samples tested indicate the presence of coliform organisms, the entire sterilization procedure shall be repeated.

3.12 PLENUM AREAS

- 1. Any duct plenum area, ceiling or room plenum shall not contain any combustible material, and all insulation, wiring and/or piping shall be suitable and approved by local authorities for plenum installation.

3.13 SCHEDULE OF WORK

- 1. The exact times and dates and schedules that the schools will be available for contractor to do work, shall be as indicated in General Conditions.

3.14 CONTINUITY OF SERVICES - EXISTING BUILDINGS

- 1. The work under the Contract shall not interrupt services to the existing buildings, except if all the following conditions are met:
 - A. Building personnel are notified in advance and approve date and time in writing.
 - B. Interruption of service does not exceed one (1) hour unless otherwise approved.
 - C. Interruption of service does not occur during normal working hours.
- 2. No "extra" compensation will be permitted due to the overtime hours implicit in the requirements of this section.
- 3. Where interruptions will affect life safety and/or other critical systems, proper precautions shall be taken to maintain level of protection or system operation acceptable to Owner and/or authorities having jurisdiction.
- 4. Contractor is cautioned that the existing building is to remain occupied during construction and that all services to the building are to be maintained. There shall be no interruption of services and, if absolutely necessary, at least seven (7) days prior notice is required.
- 5. Any interruption of life safety systems (fire alarm sprinkler) the fire department and alarm company shall be notified, and proper precautions taken.
- 6. There shall be no obstructing the exit ways from existing building.
- 7. All interruptions of service shall be done at times which cause least disruption of service.

3.15 CONNECTION TO EXISTING SYSTEM

- 1. Where new connections to existing water systems are indicated and/or required for new work, Contractor shall verify exact locations, sizes and conditions prior to doing any work.
- 2. All new connections shall have new shutoff valves.

SECTION 15015 – GENERAL REQUIREMENTS

3. The existing system shutoff valve locations and conditions shall be verified.
4. The entire piping system shall be drained. Note – To reduce draining main and branch pipe, shutoff valves may be used (to reduce drainage). However, Contractor shall base bid on the entire system being drained and not rely upon existing valves.
5. Where existing valves are found to be not operational, these shall be removed and new connections with new shutoff valves shall be used. Where existing valves serving a zone of pipe, including existing branch lines, is found to be not functioning, these shall be identified and at the time of drainage, be replaced.
6. As part of bid, Contractor shall include replacement of shutoff valves. The type of valves shall be per specification. The average size of 2' dia. shall be used for new valves. Replace insulation, hangers and appurtenances. The cost of new valves shall be for locations where permanent construction (drywall, etc.) is not required to be removed.

3.16 RELOCATION OF EXISTING EQUIPMENT

1. Contractor shall be responsible for removal, storage, relocation and installation of all existing equipment shown or scheduled to be relocated. Contractor will be responsible for capping of all existing services presently feeding existing equipment which is to be relocated and shall patch all surfaces to match existing as required.
2. All patching work shall be done by workmen skilled in this craft and shall in no way affect the stability, finish or operation of the casework or other equipment.
3. All equipment requiring plumbing connections shall be the responsibility of Contractor. A composite crew shall be used using mechanics skilled in their field.

3.17 PROTECTION OF SERVICES DURING CONSTRUCTION AND DEMOLITION

1. Contractor shall repair, replace, and maintain in service any utilities, facilities or services (in existing areas where demolition is to occur) which are damaged, broken, or otherwise rendered inoperative during the course of demolition.
2. Contractor shall effectually protect, at his own expense, such of his work, materials or equipment that may be subject to damage during the construction period.
3. All openings must be securely covered, or otherwise protected.
4. Contractor shall be held responsible for all damage so done until his work is fully done and finally accepted.
5. It shall be the responsibility of Contractor to protect existing and new motors, pumps, electrical equipment, plumbing fixtures and all phases of construction.

3.18 EQUIPMENT LIST

1. Refer to General Conditions. Exclusion of items on list does not relieve Contractor of the

SECTION 15015 – GENERAL REQUIREMENTS

responsibility from providing equipment as specified, required to complete work as shown on drawings that is to be provided by Contractor.

<u>EQUIPMENT</u>	<u>M A N U F A C T U R E R</u>			
	<u>NUMBER 1</u>	<u>NUMBER 2</u>	<u>NUMBER 3</u>	<u>NUMBER 4</u>
Plumbing Fixtures	American Standard	Kohler		Or approved equal
Mop Receptor	Fiat			Or approved equal
Sinks	Elkay	Moen	American Standard	Or approved equal
Valves	Mueller	Stokham	Nibco	Or approved equal
Insulation	Owens/Corning	Johns Manville		Or approved equal
Carriers	Josam	J.R. Smith	Zurn	Or approved equal
Plumbing Specialties	Josam	J.R. Smith	Zurn	Or approved equal
Floor Drains	Josam	J.R. Smith	Zurn	Or approved equal
Electric Hot Water Heater	Bradford			Or approved equal
Lavatory Fittings	Symmons	American Standard	Kohler	Or approved equal
Sink Fittings	American Standard	Symmons		Or approved equal
Sink Fittings	Elkay	American Standard		Or approved equal
Water Mixing Valves	Powers			Or approved equal

3.19 UNIT PRICES (See General Conditions)

1. See "General Conditions".

3.20 ALTERNATE BID

1. See "General Conditions". Refer to drawings and specifications for extent of work.

3.21 REPAIR AND PATCHING OF EXISTING SURFACES

1. Unless otherwise shown to be done by general contractor, Contractor shall cut and patch walls, floors, ceilings, roof surfaces and all existing construction for the removal of existing equipment, fixture, piping, controls and other construction for the completion of work under this Contract. All equipment, piping, ductwork, furniture and all construction or materials that are disturbed during construction shall be stored and protected from damage until replaced.
2. Cutting shall be done only after shop drawings have been prepared and with the Architect's approval. Contractor shall exercise proper care and shall not endanger the structure by indiscriminate cutting and shall be responsible for and shall protect all existing construction to remain from damage and shall provide and maintain all necessary temporary protective materials, coverings and barricades.
3. Contractor may hire the other prime contractors to perform this work or hire qualified, independent contractors. Contractor shall be familiar with and assume all responsibility for any conflicts with union policy and provide supervision in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.
4. Wherever previously unfinished areas are exposed by the removal of existing piping or related equipment, these areas shall receive new finishes to blend into the adjoining work.

SECTION 15015 – GENERAL REQUIREMENTS

5. Wherever existing chases must be enlarged to encase new work, they shall be enlarged to match the existing.
6. Wherever fire rated material must be patched, it shall be patched in a manner not to affect its fire rating.
7. All patching work must be done by skilled mechanics in a manner to minimize the patch effect. Wherever new painting is required, it shall be done with at least two coats over new materials.
8. The painting must not only cover the area of the actual patch, but also to the nearest natural break of the newly painted surface.
9. Wherever the surrounding surface to be painted is in poor condition, all loose paint shall be removed before new paint is applied.
10. Patching of existing floor must be done in a manner to assure smooth undersurface and all joints must line up with existing.
11. Wherever new vinyl or rubber bases are to be supplied, they shall match adjoining bases in height and color.
12. Whenever existing ceilings are disturbed, they shall be replaced with new ceiling tiles or patched to match existing and all services, lights, fixtures, etc. supported temporarily and permanently reinstalled.
13. In all spaces in which the contractor is working, he shall protect all existing surfaces.
14. Contractor shall remove and replace all ceilings required for his work with the exception of ceilings shown to be removed by general contractor on architectural plans.

3.22 REMOVAL

1. Contractor shall remove existing systems as indicated on drawings.
2. All equipment, cabinets, ductwork, pipe controls, all pipe insulation (except any asbestos insulation), hangers, electric wiring and all construction and appurtenances shall be removed, to complete all work under this contract.
3. Equipment identified by Owner, prior to removal, that is to be retained by the Owner, which is not to be re-installed, shall remain the property of the Owner and shall be removed undamaged and stored in a suitable location where directed by the Architect. Contractor shall then load, transport and unload equipment from building to site designated by Owner within a 20- mile radius of project.
4. Removed piping, equipment, fixtures, pipe insulation and all debris shall be removed from the building and site in accordance with General Conditions.
5. All debris in areas occupied by the building personnel during periods of building operation shall be removed daily.

SECTION 15015 – GENERAL REQUIREMENTS

6. Contractor shall patch all wall, floors and ceilings and roof surfaces to match existing adjacent surfaces where obsolete equipment, piping, controls and wiring are removed.
7. Work shown on drawings may not indicate all equipment, pipe, etc., nor exact routes, sizes, locations, etc. The drawings are not to be used for estimating detailed take-off for amount of work required, drawings are for reference only. Contractor shall visit site to determine extent of work and all conditions.

3.23 BUILDING ALTERATION WORK

1. Contractor shall furnish all labor, equipment and materials required to complete alteration work in the building. Remove existing construction and replace, to remove existing equipment and/or install new equipment in conjunction with the work.
2. Cut, patch and paint walls, floors, ceilings, roof surfaces and all construction for the installation of equipment, piping and controls.
3. Cut and patch exterior walls for the installation of air intake and exhaust. Finish to match existing adjacent surfaces.
4. Where existing electrical HVAC or plumbing work, due to removal of existing and/or installation of new equipment, is required to be removed. Contractor shall disconnect existing equipment, cap services in a safe manner, remove equipment, store in a location to prevent damage, replace equipment and patch construction to match existing conditions and reconnect equipment to existing services.
5. Contractor shall either retain qualified independent contractors or utilize the other on-site contractors. Contractor shall assume all requirements for any conflicts with union policy and be responsible for same. Contractor shall furnish necessary shop drawings and supervision, in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

3.24 CONSTRUCTION SEQUENCING

1. Refer to General Conditions for the overall contract staging. However, specific items for plumbing contractor should be noted. The following are suggested methods of staging of construction. Alternate methods to achieve the intent of these specifications will be allowed; however, they must be coordinated with other trades and submitted for review and approval.
2. The sequence of construction shall be as indicated in the General Conditions of the specifications.
3. Where work is shown on plumbing plans where it is outside the phase areas indicated or specified in the General Conditions, this work shall be done at any time. All work shall be done so not to interfere with normal school operations. Where work is done outside normal school occupied areas (boiler room, roof area), this work may proceed at contractor's option. All work, regardless of the location of work, type of work, or extent of work, shall be done with the approval of the School District.

SECTION 15015 – GENERAL REQUIREMENTS

4. Where work in a particular phase requires work to be done outside that phases' construction boundaries, Contractor shall locate all new duct, pipe, and equipment to allow for new construction and/or to integrate with existing building construction.
5. All new ductwork and piping shall be installed and coordinated with proposed new work.
6. All work required to be modified due to non-compliance with this section, General Conditions or Construction Sequencing, shall be removed, replaced and/or modified at no additional cost to Owner.
7. Where pipe is shown to serve future phases, provide capped outlet suitable for connection when phase is completed. Provide valves for isolation and draining lines without affecting the work installed in earlier phase.

END OF SECTION
15015.6362

SECTION 15115 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 MATERIALS AND EQUIPMENT

1. All material and equipment used for this contract shall be unused and of the latest model or design available. Equipment shall be installed in strict accordance with manufacturer's recommendations and details.
2. Materials not specifically described but indicated or incidentally required shall be acceptable to the Architect and/or Engineer. Submit shop drawings. Materials shall be delivered, stored and handled so as to preclude injury by weather, dirt or abrasion.
3. Contractor shall use only specifically assigned areas for storage of materials and construction operation, unless other areas are authorized by the Owner. Such areas will be identified after the award of Contract by Owner. Comply with local municipal regulation regarding use of and parking on public streets.
4. Contractor shall repair streets, drives, curbs, sidewalks and any existing surface where disturbed by construction operations and leave them in as good condition after completion of the work as before operations started.

1.02 PROTECTION

1. No pipe shall be left open any longer than is required to affix the next piece. If pipe ends are to be left for a protracted period they shall be closed with approved plugs or caps.
2. All equipment shall be covered to protect it from damage; all damage is the responsibility of Contractor.
3. Any pipe, equipment or construction in existing building shall be done in such a manner to prevent injury to building personnel. Particular care must be taken for any work which will be done during building's normal operation.

1.03 IDENTIFICATION OF PIPING

1. Use color scheme for painting listed in "Scheme for Identification of Piping System", ANSI/ASME A13.1 and Rust-Oleum Corporation Form # 117 Or approved equal. Paint identifying bank of color near each valve and fitting, on both sides of pipes passing through wall, and on long pipe runs approximately every 30' (closer when directed), throughout building. Exposed piping in mechanical rooms and all other areas including insulation, hangers, supports, valves and all appurtenances shall be painted color selected.

Gas Pipe	Yellow (Note: Paint all exposed and rooftop gas pipe.)
Domestic Water	Light Blue
Domestic Hot Water	Orange
Sanitary	Dark Blue
Vent	Blue

2. Stencil on pipe, near each valve, name of pipe contents in abbreviated form, size of pipe, and arrow indicating direction of flow. Place legend in such location that it can be read from floor. Size of stencil letters shall vary with the size of pipe.

SECTION 15115 - BASIC MATERIALS AND METHODS

3. Seaton "SETMARK" pipe markers or approved equal are acceptable.

1.04 TESTING

1. At the completion of all work, and before any covering is applied, all piping except drainage shall be tested hydrostatically at a pressure equal to 150% of the working pressure or to material test pressure, if lower. All piping concealed in any manner shall be tested before being concealed. Maximum drop in pressure permissible shall be two (2) psi in 24 hours.
2. The drainage system shall have openings plugged and be filled with water to the level of the main gutter or top of vent pipes and allowed to stand at least thirty minutes. Each stack may be tested separately.
3. Testing shall be in accordance with ANSI B31.1 in all test gauges, traps and all other apparatus which may be damaged by the test pressure shall be removed or valved off from the system before tests are made.
4. In existing building all required tests on new and/or existing systems shall only be done after normal working hours. All tests done in building shall be done in such a manner as to avoid injury to building personnel and damage to existing and/or new construction. Protect all new and existing construction from damage which may occur as a result of the test or failure of test material.
5. Contractor shall be responsible for all costs associated with damage to materials or liability due to injury to personnel, as a result of tests or failure of tests.

1.05 PRESSURE RATINGS

1. All equipment and materials shall have a working pressure as determined by A.S.M.E. (or similar body), of not less than 125 psi.

1.06 SLEEVES

1. All pipes passing through construction shall be fitted with flush sleeves of sufficient diameter to pass the insulation. Sleeves shall be 20 USG galvanized iron, except in masonry, where steel pipe sleeves shall be used. Sleeves in waterproof construction shall be steel pipe, waterproofed with modular mechanical synthetic rubber seals equal to "Link Seals" (Thunderline, or equal). In floors they shall extend on inch above the floor.
2. In fire divisions, sleeves shall be constructed of fire-retardant material and shall be installed to maintain the fire integrity of the fire division.
3. All materials and construction methods shall be installed in accordance with the manufacturer recommendations and the requirements of the IBC Code or any other applicable codes.

PART 2 PRODUCTS

2.01 PIPE

1. Steel pipe shall be Schedule 40, electric welded, ASTM-A53, Grade A, plain or galvanized as specified under applicable system.

SECTION 15115 - BASIC MATERIALS AND METHODS

2. Copper tubing shall be hard temper "Type L" except that all piping underground shall be "Type K", conforming to ASTM-B-88.
3. Cast iron soil pipe shall be extra heavy Bell and Spigot spun type conforming to ASTM-A-74. Standard or medium weights may be used, if permissible under local code.
4. PVC Pipe
 - A. Polyvinyl chloride pipe (PVC) shall be Schedule 40 conforming to ASTM-D-2241.
 - B. Sound rating exposed PVC pipe in finished areas shall have sound rating equal to or less than the sound radiated from cast iron pipe (25-30 DB).
 - C. Where sound ratings are greater, contractor shall install insulation wrap to reduce the radiated sound to less than the sound radiated for cast iron pipe.
 - D. Contractor to install PVC pipe with supports at intervals required by the applicable plumbing code.
 - E. Provide fire listed fire stop devices or collars in accordance with ASTM E814 on both sides of pipe penetrations of fire rated assembly temperature.
 - F. PVC pipe shall not be used where temperatures exceed 140°F.
 - G. All underground pipe to be installed in accordance with ASTM D2321.

2.02 PIPE FITTINGS

1. All welded fittings shall be of the same thickness and material as the pipe meeting ASTM-A234. Branch connections shall be made with Weldolets or welding fittings.
2. All flanges shall conform to A.S.A. B-16 using gaskets suitable for the service.
3. Cast iron drainage fittings shall be standard weight galvanized cast iron, banded and recessed.
4. Malleable iron fittings shall be 150 psi wsp conforming to ASTM-A-338.
5. Fittings for copper tubing shall be wrought copper of the solder Type conforming to A.S.A. B16.22.
6. Extra heavy cast iron soil pipe fittings shall conform to ASTM-A-74, all changes in direction being made with "Y" branches or 1/8" (or less) bends.
7. A.S.A. A21.10 or AWWA Class 250 cast iron fittings shall be used on cast iron water pipe and A.S.A.11 Class 250 mechanical joint pipe. All piping shall be properly blocked. Use lined fittings in lined pipe.
8. Fittings for polyvinyl chloride (PVC) shall be socket fittings or solvent welded.

SECTION 15115 - BASIC MATERIALS AND METHODS

2.03 BALL, GLOBE AND CHECK VALVES

1. All valves 2" or smaller shall be ball valves; bronze solder end valves in copper tubing and screwed end in other lines. Globe and swing check valves shall be of similar construction with renewable composition disc.
2. All valves 2½" or larger shall be 125 psi WSP, 200 psi WOG bronze mounted, silicon bronze stem, outside screw and yoke, blotted bonnet and follower gland, iron body, flanged end, wedge gate valves. Valves shall be provided with back seat to permit packing under line pressure. Globe and Swing check valves shall be of similar construction with renewable, regrinding, bronze disc and seat.

2.04 PLUG AND BALL VALVES

1. Plug and ball valves shall be 150 psi WOG with full port. Valves to be lever operated, screwed or solder end in sizes up to 2". Valves used for balancing shall have infinite throttling handle and adjustable stops. All valves bubble tight shut-off.
2. Plug and ball valves shall be 150 psi WOG with full port. Valves to be lever operated, screwed or solder end in sizes up to 2", flanged end in 2½" to 6" size.

2.05 UNIONS

1. Unions shall be installed where needed to facilitate the removal of equipment.
2. Unions 2" and smaller in copper tubing shall be all brass, ground joint, solder end. In other lines, screw end, malleable iron, 125 psi WSP, 300 psi WOG of the ground type.
3. Unions 2½" and larger in copper tubing shall flanged pattern, all brass, solder end. In other lines, 125 psi WPS-175 psi WOG, cast iron flanged pattern, black or galvanized to match piping.

2.06 ESCUTCHEON PLATES

1. Where any pipe passes into a finished space, there shall be provided a solid brass, chrome plated, escutcheon plate held to the pipe mechanically or fastened to the building construction.

2.07 ANCHORS

1. Anchors of approved design shall be provided where shown or required for the proper control of the stress due to expansion. Anchors shall be heavy metal sections securely fastened to the building construction.

2.08 DRIP PANS

1. Provide drip pans for all pipes and equipment carrying liquid or, liquid vapors where pipes pass over areas or electrical equipment. Drip pans shall be constructed of galvanized metal. Provide drain line to closest sanitary line.

SECTION 15115 - BASIC MATERIALS AND METHODS

2.09 ACCESS PANELS

1. Furnish and install access panels not smaller than 18"x18", for access to all concealed valves, and equipment, accessories, etc.
2. Access panels shall be all steel construction with a No. 16-gauge wall or ceiling frame and a 16-gauge wall or ceiling frame and a 14-gauge panel door with not less than 1/8" insulation secured to inside of door.
3. Doors shall have concealed hinges and cylinder lock except doors for wall panels may be secured with suitable clips and countersunk screws.
4. Access panels shall be flush with finished wall or ceiling and shall be painted to match adjacent surfaces. Access panels behind finished surfaces shall have color coded marking on finished surface to indicate location of doors and type of equipment.
5. Access panels in fire rated construction shall be fire rated.

2.10 ANCHOR BOLTS

1. Contractor shall furnish and install anchor bolts as required for the equipment. Anchor bolts shall be DECO's (or approved equal) standard anchor with floating nut, adjustable 1/2" in any direction. Grout all bases.

2.11 HANGERS

1. All piping shall be supported by hangers, concrete inserts, and insulation saddles conforming to MSS-SP-58.
2. Hangers for cast iron pipe shall be spaced at least one per length, but not more than 7' apart. For steel and copper pipe, pipe shall be spaced not over 8' apart.
3. Vertical runs of pipe shall be supported by riser clamps except that pipe 1 1/4" and smaller may be braced by galvanized malleable iron fasteners.
4. Hangers for copper tubing shall be copper plated, and completely encircle the tubing. A hanger shall be placed no further than 24" from each change in direction of piping.
5. Hangers shall not be connected to or supported from other pipe, conduit or equipment, but shall be supported from building structure.

2.12 STRAINERS

1. Strainers to be self-cleaning ("Y" type), cast iron body installed ahead of all control valves and pumps; screens to be Monel or stainless steel with proper perforations for the service, ends to be screwed to 2" size, flanged for sizes 2 1/2" and larger.
2. Provide ceramic magnets in each strainer used in systems containing iron.

SECTION 15115 - BASIC MATERIALS AND METHODS

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

1. Contractor shall do all excavating and backfilling necessary and repair finished surfaces that are disturbed. Contractor shall remove or distribute all earth remaining as directed, and/or provide required backfill.
2. Excavate all substances encountered to the depths and sections shown on drawings. Excavation for pipes, manholes, catch basins, drain inlets, and other accessories shall have 12" clearance on all sides.
3. Areas adjacent to any excavation shall be graded to prevent water running in. Excavation shall not be carried below the required level, and if so carried; shall be backfilled with gravel or sand and tamped to proper compaction.
4. Contractor shall do bracing, sheathing, shoring, and pumping necessary for proper completion of the work and for protection of excavations or as required for safety. Temporary bridges or crossings shall be built where required to maintain traffic.
5. After proper inspection and tests all excavation shall be backfilled with approved material, free from large stones, clods or frozen earth, wood and other objectionable material. Contractor shall haul away excess material or provide additional fill as required.
6. Backfill for pipes shall be placed evenly and carefully around and over the pipe in six-inch minimum layers. Each layer shall be thoroughly and carefully rammed by hand until one-foot cover exists over the pipe. The remainder of the backfill shall then be placed, moistened and compacted to a density equal to that of adjacent original materials using mechanical tamping machines.
7. Backfill for sewage ejector and other structures shall be placed symmetrically on all sides in one-foot maximum layers and shall be compacted with mechanical or hand tampers to density equal to 90% of laboratory density in accordance with ASTM-D698 test.
8. Where trenches pass under footings backfill with tamped concrete, 2,500 psi minimum, around steel pipe sleeve.

3.02 INSTALLATION OF PIPING

1. All fittings, offsets, etc., may not be shown. Contractor shall determine their necessity by investigating conditions at the site.
2. Contractor shall use shop drawings for exact locations.
3. All piping above ground shall be run parallel with the lines of the building in the most direct manner, concealed in furred spaces where possible.
4. Pipes shall be cut accurately and placed without springing or forcing all burrs removed.
5. All water piping inside the building shall be properly graded to drain 1/2", hose outlet, angle drain valves.

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6. All changes in size of piping shall be made by reducing fittings; no bushing will be permitted unless approved.
7. Contractor shall determine, with approval, where expansion joints, loops or anchors will be required due to space restrictions prohibiting proper run-out flexibility.
8. Valves, air vents, balancing cocks, etc., shall be placed in accessible positions, and flush metal access doors, (12"x12" minimum size), with necessary lintels, etc., provided where they are concealed.
9. All piping shall be located to prevent freezing. Where pipe is located in areas subject to freezing, provide freeze protection and insulation. Refer to Specification Section 15185.

3.03 CLEANING OF GRAVITY SYSTEMS – INITIAL CLEANING

1. Prior to start of construction and/or renovation work, Contractor shall provide a hydro-jet cleaning and a video inspection of the entire existing gravity sanitary system.
2. The cleaning shall be all existing sanitary pipe to 5' +/- outside of building.
3. Contractor is responsible for all work and all cost of work. Contractor shall use the latest technology to perform the hydro-jet cleaning and video inspection.
4. Work shall be done so that any debris and blockages encountered shall be removed. Take proper precautions (i.e. screening, etc.) to prevent the debris and material from entering the municipal sewer system.
5. Any blockages encountered which cannot be removed by hydro-jet cleaning shall be the responsibility of Contractor to remove.
6. Any leaks encountered shall be reported to Owner.
7. At the completion, provide video with a written test report to Owner.

3.04 CLEANING OF GRAVITY SYSTEMS – FINAL CLEANING

1. At completion of project, prior to owner occupancy, Contractor shall provide a hydro-jet cleaning and a video inspection of the newly installed gravity sanitary systems. The scope of work are all existing and new gravity systems installed in building and outside building as indicated in Section 3.03 for initial cleaning.
2. Contractor is responsible for all work and all cost of work. Contractor shall utilize the latest technology to perform the hydro-jet cleaning and video inspection.
3. Work shall be done so that any debris and blockages encountered shall be removed. Take proper cautions (i.e. screening, etc.) to prevent the debris and material from entering the municipal sewer system.
4. Any blockages due to new construction work which cannot be removed by this hydro-jet cleaning shall be the responsibility of Contractor to remove. Remove and replace all existing

SECTION 15115 - BASIC MATERIALS AND METHODS

construction, pipe and equipment necessary to access pipe system to clean pipes and clean system to the satisfaction of the owner, engineer and local authorities having jurisdiction.

5. Any leaks due to new construction and/or renovation work shall be the responsibility of Contractor to repair to the satisfaction of the owner, engineer and local authorities having jurisdiction.
6. At the completion provide video with a written test report to Owner.

3.05 DRAINAGE PIPING

1. All vent piping may not be shown. Contractor shall install all vents that may be required by local authorities.
2. All piping shall be so installed that any point in the system can be cleaned by a standard-length snake.
3. It is intended that no horizontal pipe be built into masonry.
4. Vent piping shall be extended full size (minimum 3") above the roof. Offset vents at roof to clear structure.
5. Provide cleanouts at all traps, the bases of all stacks and rain conductors, changes of direction greater than 45 degrees and other points shown on drawings or required by authorities having jurisdiction, on 4" dia. pipe or less, maximum 75' and 5" dia. pipe and larger; 100' maximum. Cleanouts in buried piping shall be brought up flush to finished floors, outside to 18" below finished grade. Cleanout shall be full size for pipe up to 4", and 4" in larger pipes.
6. Exterior cleanouts shall be cast brass raised plug type.
7. Interior cleanouts shall be similar with polished nickel bronze access cover for flush mounting.
8. In concrete floors cleanouts shall be cast brass countersunk plug type with nickel bronze adjustable head and heavy duty scoriated cover.
9. Provide two-way cleanouts at all sanitary laterals at exterior of building.
10. Coordinate locations of all cleanouts with other trades. Relocate or add cleanouts when interferences occur at no additional cost to Owner.
11. Where pipe is installed in previously compacted fill, Contractor shall be responsible, at no additional cost to Owner, to backfill and compact soil to within tolerances provided by Architect.

3.06 JOINING PIPE

1. Steel piping shall be of welded or flanged construction in sizes 2½" and larger; screwed or welded construction in sizes 2" and smaller. All screwed fittings to be cast iron unless otherwise specified. All threads shall be conformity with A.S.A. B-21.

SECTION 15115 - BASIC MATERIALS AND METHODS

2. All screwed pipe joints shall be made with Teflon Dry Thread Sealer (3M-#48) or approved equal applied to male threads only.
3. Soldered joints shall be made with non-acid flux and lead-free solder (ASTM 32-60AT). Fluxes shall be used sparingly, and excess wiped from copper.
4. For domestic hot and cold water pipe branches 1½" below, Contractor may use Pro-Press system.

3.07 JOINING DISSIMILAR METALS

1. Where copper is jointed to steel, joints shall be made by means of brass or bronze adapter in a cast iron fitting or by means of an electrochemically insulated union.
2. Hangers supporting copper tubing shall be copper, or copperized. Copper tubing lines shall not be, even temporarily, supported or secured to ferrous metals.

3.08 FOUNDATIONS

1. Foundations shall be provided by Contractor for all equipment mounted on concrete floors and shall be of concrete construction not less than 6" high unless otherwise shown.
2. Details of all foundations shall be submitted for approval.
3. Foundations or footings for structural steel supports shall be carried to a point not less than 12 inches below the underside of the floor slab, except where rock is encountered at less depth, then foundation may set on the rock.
4. All foundations shall be built to templates and reinforced as required by the load to be imposed upon them.

3.09 STRUCTURAL STEEL

1. Contractor shall furnish and install all structural steel, supports, braces, hangers, etc., required for his Contract unless shown as being supplied by others.
2. Structural steel shall conform to "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction, and where applicable, "Code for Welding Building Construction", of the American Welding Society.

3.10 ERECTION AND RIGGING

1. Contractor shall do all rigging, hoisting and setting-in place of all equipment furnished by him or as shown on drawings or as specified herein.

3.11 NATURAL GAS

1. The gas piping system shall be installed, and final connections made as part of the section titled, "GAS PIPING".

SECTION 15115 - BASIC MATERIALS AND METHODS

2. Any contractor supplying gas-fired equipment shall leave such equipment complete and ready to operate so that only the final connection of gas piping will be required.

END OF SECTION - 15115.6362

SECTION 15185 - INSULATION

PART 1 GENERAL

1.01 SCOPE

1. All surfaces throughout the work shall be insulated with fiberglass insulation as indicated in applicable section.
2. Removal, repair and/or replacement of existing insulation on all existing pipe and equipment due to new work or connection of new work to existing.

1.02 SURFACE TEMPERATURE

1. Where surface temperature can exceed 350° F. substitute calcium silicate insulation.

PART 2 PRODUCTS

2.01 PIPE INSULATION

1. All piping throughout the work shall be insulated with fiberglass pipe insulation in thickness, indicated in 3.04, of high density and with jacket indicated in the applicable section. (Except that outside thickness shall be doubled.) Vapor barrier jackets shall have self-sealing lap joint, and joints between sections shall be covered with a 4" wide strip to self-sealing vapor barrier materials.
2. Aluminum bands shall be applied, two to a section on all indoor insulation.
3. On outdoor installations, double insulation thickness and provide metal jacket banded or with sheet metal screws.
4. All pipe exposed in finished areas shall be painted color selected. Where insulation is subject to damage or is located below 7'- 0" AFF, insulation shall have stainless steel jacket with no exposed joints or seams.
5. All insulation shall be "plenum rated".

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE INSULATION

1. All pipe insulation shall be applied over dry, clean surface with joints tightly butted and jacket firmly and securely attached and smoothed. Insulation shall be continuous through wall, floor or ceiling openings and sleeves.
2. All valve bodies and fittings shall be insulated with preformed fittings of thickness equivalent to adjacent insulation and jacketed with same material. At Contractor's option, except in plenums, outdoors and where not permitted by code; provide precut fiberglass insulation blanket of same insulation thickness as adjacent insulation with a preformed snap on type molded PVC jacket, cover edges with vapor barrier adhesive or vapor barrier tape.

SECTION 15185 - INSULATION

3. Provide metal shields under all hangers or pipe supports on outside of insulation; on roller supports provide pipe shoe cavity with insulation. Provide insert between support shield and piping on piping 1 1/2" dia. and larger. Insulation inserts shall be heavy duty insulation material length 12" up to 6" dia. pipe 16" long on 8" & 10" pipe, and 22" long on 12" pipe and larger. **HANGERS SHALL NOT PENETRATE PIPE INSULATION.**
4. On outdoor insulation, double insulation thickness, provide metal jacket; and prefabricated, removable and replaceable metal jacket at fitting and valves.
5. Locate insulation and cover seams in least visible locations, neatly finish insulation at supports, protrusions and interruptions.

3.02 EQUIPMENT INSULATION

1. All equipment containing fluids whose piping is specified to be insulated or whose surface temperatures will be low enough to cause condensation (60° F.), or high enough to burn persons touching same (110°F.), shall be insulated with a minimum of 1 1/2" thick fiberglass block firmly butted and wired in place, and covered with 1/2" thick coat of insulating cement troweled over one inch galvanized hexagonal wire mesh and finished cement troweled smooth. Metal corners beads shall be applied to protect corners.

3.03 INSULATION THICKNESS

1. Minimum pipe insulation thickness shall be in accordance with the ASHRAE 90.1-2007, local requirements, or the following table:

PIPING SYSTEM CLASSIFICATION	FLUID TEMP. RANGE,F.	INSULATION THICKNESS IN INCHES FOR PIPE SIZES		
		1"and LESS	1-1/4 to 2	2-1/4 to 4 and over
Domestic Hot Water Supply and Return	120-200	1"	1"	1"
Domestic Cold Water	40-60	1"	1"	1"
Horizontal Storm Lines		1"	1"	1"

2. Where piping runs outdoors, double insulation thickness.
3. This Contractor shall provide heat tape (electric) to prevent freezing of outdoor piping and all other piping subject to freezing. Electric heat tape to be Chromalox Type M1 cable or approved equal, furnished with all controls, power wiring and appurtenances. Size and capacity per manufacturers' requirements.

END OF SECTION
15185.6362

SECTION 15410 - WATER SUPPLY SYSTEMS (INTERIOR)

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include furnishing and installation of:
 - A. All domestic water piping, insulation, plumbing material and specialties required for the proper functioning of the work. Connections to all equipment requiring domestic water connections whether furnished under this section or not. Sloped piping and valves to permit drainage of entire system.
 - B. Connection to, modifications, extension, replacement, and/or removal of existing system and equipment for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIAL

1. Water Services - Copper Tubing Type "L", Type "K" underground. All exposed piping under and adjacent to fixtures shall be chrome plated brass pipe. All pipe shall have lead-free solder.

2.02 STORAGE WATER HEATER

1. Furnish and install domestic hot water heaters as shown on plans. Heaters shall have pressure temperature relief valved piped to receptor. Insulate in accordance with ASHRAE-90 requirements.
2. Fuel fired units shall have breeching and flues as required and as specified in Section 15860.
3. Provide emergency shutoff switches with all wiring per code.
4. Provide combustion air and interlock with combustion air to allow for operation of combustion air only during periods of use.
5. For units installed above or elevated above fixtures, provide support, emergency drain pan and vacuum breakers.

2.03 STORAGE WATER HEATER EXPANSION TANK

1. Provide expansion tank on domestic hot water heaters where required and where heaters are installed with check valve on cold water and/or on installations with backflow preventers on main water service.
2. Expansion tank to be installed on cold water inlet to storage heater.
3. Tank shall be equipped with air inlet and water drain off and shall be diaphragm type tanks (Amtrol Therm-X-Trol Model ST or approved equal), where required provide ASME tanks.
4. Minimum tank volume shall be .11 gallons expansion tank per gallon of storage tank capacity.

SECTION 15410 - WATER SUPPLY SYSTEMS (INTERIOR)

Volumes based on 140°F. water temperature, for higher temperatures adjust volumes accordingly.

2.04 MIXING VALVES

1. Provide new domestic water tempering valves;

Powers Model MM or approved equal; Self-contained power station, single valve, 20 GPM, 10 PSI with internal bypass and gauges and mounted on heavy duty welded struts (factory assembled).

PART 3 EXECUTION

3.01 INSULATION

1. See Section titled "INSULATION".
2. Domestic Cold Water, Hot Water and Hot Water Recirculating Line - Fiberglass with all service jacket.

3.02 STERILIZATION

1. After the tests have been completed, and before the system is put into operation, the entire water system shall be sterilized as required in Section 15015.

3.03 MINIMUM COVER FOR EXTERIOR LINES

1. Water Lines - three feet six inches (3'6").

3.04 EXPOSED LINES

1. All domestic water pipe in finished areas shall be concealed in drywall and/or concrete block walls. Where installed in concrete block walls, pipe to be installed within cores and done without cutting block. Where it is not possible to locate in wall without removing block, Contractor shall coordinate location and sizes required. Contractor shall cut and repair block. Finishing of block shall be suitable for painting.
2. Where is determined by construction manager and/or architects that pipe must be exposed in finished area, it shall be enclosed in sheet metal chase constructed per architectural details by Contractor.
3. No pipe shall be allowed in finished areas, except where specifically indicated (backflow preventers, etc.) Pipe shall be insulated and protected per Specification Section 15185. Exposed pipe runouts to fixtures shall be chrome plated.

END OF SECTION
15410.6362

SECTION 15420 - SOIL AND WASTE SYSTEM

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:
 - A. All soil, waste and vent piping, including connections to sewers. All materials and specialties required for the proper functioning of the work. Connections to all equipment requiring soil, waste or vent connections whether furnished by this Contractor or not.
 - B. Connection to, modification, extension, replacement, and/or removal of existing system and equipment required for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Drainage Systems - Cast iron soil pipe. Galvanized steel, copper tube, etc., may be acceptable if locally approved for underground and above sanitary.
2. All sanitary pipe below floor shall be Schedule 40 PVC.
3. All vent pipe above grade in plenums shall be cast iron.

2.02 JOINTS

1. Neoprene gasket joints may be acceptable if locally approved.
2. "No Hub" pipe, fitting and joint material may be acceptable if locally approved.

PART 3 EXECUTION

3.01 MINIMUM COVER FOR EXTERIOR LINES

1. Soil Lines – 3'-0"

3.02 PIPE INSTALLATION

1. Provide minimum slope of 1/8" per foot or as required by local code. Install cleanouts at lower ends of stacks, at each change of direction, where indicated, or required by local code. Support cast iron pipe risers at base of stack and at hubs.
2. Offset vent lines through roof to obtain minimum visibility from front of the building. Extend vents a minimum of 2' above roof line.
3. Flash vents passing through roof with sheet lead (6 lbs./Sq.Ft.). Extend lead vertically up pipe and turn down into bore 2" or terminate in special flashing collar. See Section titled "General Requirements - Flashings".

END OF SECTION-15420.6362

SECTION 15440 - GAS PIPING SYSTEM

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:
 - A. All gas piping including all materials and specialties required for the proper functioning of the work. Connections to all equipment requiring gas connections whether furnished by this Section or not.
 - B. Gas service in accordance with local regulations including meter pits if required or shown.
 - C. Connection to, modification, extension, replacement, and/or removal of existing system and equipment as required for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Steel pipe with malleable iron fittings unless otherwise required by local authorities. All underground piping shall be coated in accordance with the recommendations of the local utility. Use approved connectors and/or connection details for all equipment. All pipe above 2" dia. shall be welded.
2. All gas pipe shall be painted "yellow" including but not limited to pipe on roof and above ceilings.
3. Label all gas pipes with "GAS – Gas Pressure".
4. Provide check valve on discharge of regulator for each line feeding labs.

2.02 GAS REGULATORS

1. All gas regulators shall be sized to handle the maximum connected load of equipment regulator serves and for the minimum and maximum pressure requirements of equipment.
2. All gas regulators shall be 15# burst rated. Indoor regulators shall be vented to outdoors and pipe type, termination locations, pipe size per regulator manufacturer.
3. All regulators shall be shipped with the proper spring (color coded), field installation not allowed.
4. All outdoor valves shall have pipe at vent to prevent moisture infiltration.
5. All valves to be installed in strict accordance with all gas company requirements.

SECTION 15440 - GAS PIPING SYSTEM

PART 3 EXECUTION

3.01 PIPE INSTALLATION

1. All gas piping shall be installed in accordance with the International Fuel Gas Code, NFPA-54 and the recommendations of the local utility including coating, ventilation and/or protection.
2. All gas pipe shall be painted "yellow" including but not limited to pipe on roof and above ceilings.
3. Label all gas pipes with "GAS - Gas Pressure".

3.02 CONNECTIONS TO EQUIPMENT

1. All connections to equipment shall have shut offs and drip legs and shall be in accordance with equipment manufacturer's requirements. All shutoff valves shall have 1/8" NPT plugged tapping for pressure testing. Verify final location and type of connection in field.
2. All connections to movable equipment shall have flexible connections, quick disconnects. All kitchen equipment shall have stainless steel flexible connections.

3.03 GAS SERVICE AND METERS

1. Coordinate all requirements for metering with local gas company. All new meters are to be installed in accordance with gas company's requirements.
2. The size and capacity of the existing gas service and meter to be coordinated with gas company based on new loads.
3. Provide a label at service entrance - Natural Gas - CAS-74-82-8 with indication of gas pressure.

3.04 ROOFTOP PIPE

1. Provide roof supports per details on architectural plans and/or gas company requirements. Provide expansion loops.

3.05 COMBUSTION AIR

1. All-natural gas-fired appliances located indoors shall have adequate provisions for combustion air. All combustion air installations shall be installed per NFPA-54/ANSI-Z-223.1, National Fuel Gas Code latest edition, and per local gas company requirements.

3.06 GAS PRESSURE

1. All gas-fired equipment furnished under this Contract shall be rated to operate at minimum 5.0" w.c. gas operating pressure, unless otherwise noted.
2. Prior to installation of gas pipe, this Contractor shall verify the pressure requirement of all gas-fired equipment furnished under this Contract or under other Contracts

SECTION 15440 - GAS PIPING SYSTEM

3. Where gas pressure exceeds 6.0" WC or where high pressure in excess of 14" WC is utilized, provide pressure regulators in all gas lines where appliances are not rated for higher gas pressure. Pressure regulators shall be sized and installed per manufacturers' requirement. All regulators installed indoors shall be vented outdoors.

3.07 RELOCATION OF EXISTING GAS MAIN

1. The existing gas main from main in street to meter is per gas company requirements.
2. The existing gas main is under proposed new building. The gas main will have to be relocated so it is not under proposed building. The Contractor shall be made aware that this a time critical item. Coordination with the gas company shall be the responsibility of the Contractor. The exact route needs to be determined in field with gas company. The exact timing needs to be coordinated with gas company and with other trades. Refer to General Conditions for timing, however this work needs to be done prior to any other work.

END OF SECTION
15440.6362

SECTION 15450 - PLUMBING FIXTURES AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install complete with all necessary trim, hangers, etc., all plumbing fixtures and equipment required for the Contract.
2. All handicapped fixtures shall be installed per American Disabilities Act (ADA) and applicable guidelines.
3. Install all fixtures at heights indicated on architectural plans.
4. Provide all offset piping and special tail pieces per manufacturer requirements to comply with clearances per ADA.
5. Adjust heights of carriers due to depressed floors in toilet rooms.
6. All fixtures, equipment and appurtenances where manufacturer and manufacturers' model numbers are specified shall be "or approved equal".

PART 2 PRODUCTS

2.01 YOUTH HANDICAPPED WATER CLOSETS

1. **P-1** – American Standard Model 2282001.02 "Baby Devoro" with American Standard Model 6065161.002 "Ultima Selectronic" (or approved equal) battery powered sensor operated flush valve, 1.6 gal./flush. Note – Flush valve requires 25 psi minimum working pressure.
2. **P-1A** - American Standard "Afwall" (or approved equal), elongated rim, wall mounted bowl, siphon jet with 1½" dia. top spud with American Standard Model 6065161.002 "Ultima Selectronic" (or approved equal) battery powered sensor operated flush valve. Note: Flush valve requires 25 psi minimum working pressure.
3. Seats shall not be sprung to return to a lifted position.
4. Flush valves and controls shall be installed in accordance with ADA guidelines Section 4.16.5 and 4.27.4.

2.02 CLOSET SEATS

1. Heavy duty, open front, cut out back, seat no cover, stainless steel check hinge, solid section, high impact polystyrene white seats.
2. Handicapped Applications - Provide seat cover where required to meet requirements of ADA, Section 4.16.5 and 4.27.4.

2.03 **P-2 & P-2A** - HANDICAPPED WALL HUNG LAVATORIES

1. American-Standard "Lucerne", 20"x18" (or approved equal), vitreous china wall hung lavatory for concealed arms. Mount unit as required to maintain clearances per local codes.

SECTION 15450 - PLUMBING FIXTURES AND EQUIPMENT

2. Provide insulated domestic hot water and sanitary under sink with fiberglass insulation and PVC protected cover.

2.04 LAVATORY TRIM

1. **P-2** – Sloan Basys Model EFX-250 (or approved equal) deck-mounted sensor operated faucet below deck, Model 170LF (or approved equal) thermostatic lead-free mixing valve with Truebro lav or approved equal guard 2 undersink piping covers.
2. **P-2A** – Sloan Basys Model EFX-250 (or approved equal) deck-mounted sensor operated faucet below deck, Model 170LF (or approved equal) thermostatic lead-free mixing valve. All 20"x18" wall hung china lavatories shall be furnished with "TRUEBRO, INC. LAV SHIELD protective enclosure, Model #2018-AS-L1 or approved equal. Lav Shield shall be constructed of rigid high-impact, stain-resistant PVC, 0.093" nominal wall thickness, shall have UV protection and shall be furnished and installed with seven (7) virtually indestructible – tamper resistant stainless screws with wall anchors. Color shall be china white. Lav Shield shall fit all ADA-conforming 20"x 18" wall hung china lavatories. Lavatories shall be paintable with acrylic enamel or latex paint. Lav Shield shall be UL listed in accordance with ADA Article 4.19.4 Flammability ratings; UL-94 V-0, 5VA ASTM D-635-91 4 (ATB) 2.1 (AEB). Lav Shield shall be listed for bacteria/fungus resistance per ASTM G21 and G22 – Result 0 growth.

2.05 **P-3** - MOP SERVICE BASINS

1. Fiat 24"x24" molded stone mop service basin Model MSBIDTG2424 with #830-A supply fitting and #889CC mop hanger (or approved equal).

2.06 SUPPLIES, TRAPS, CARRIERS, ETC.

1. Provide chrome plated supplies with screw driver stops for all fixtures.
2. Provide traps, deep seal where required, for all fixtures, chrome plated where exposed.
3. Provide Josam (or approved equal) carriers for all wall hung fixtures. All bases, where required, to be block type. with 4"x3" reducing bushings fabricated steel cabinet with flow control and fresh air inlet.

2.07 **P-4** - FLOOR DRAINS

1. Finished Spaces - Josam 30000-S (or approved equal) with square nickaloy strainer of recommended size.
 - A. Floor drains installed in tiled floors shall be Josam 30000A (or approved equal) with square nickaloy strainer of recommended size and installed and coordinated with tile layout, so drains are located within the tile pattern in a manner to minimize cutting of tile.
2. Provide deep seal traps J.R. Smith Quad Seals (or approved equal) for ALL floor drains.

SECTION 15450 - PLUMBING FIXTURES AND EQUIPMENT

2.08 SHOCK ABSORBERS

1. Josam 75000 Series (or approved equal) in size recommended by P.D.I. on each group of fixtures.
2. Install above chase in ceiling or install where accessible for service.

2.09 **P-5** - STAINLESS STEEL SINK

1. Elkay Model Crosstown Model ECTSRAD25225TBG or approved equal under counter mounted stainless steel sink, 25"x22", ADA compliant, 18-gauge, polished satin finish and sound guard with Chicago Faucet Model 527-ABCP or approved equal deck-mounted manual faucet with 8" centers, 6-1/4" rigid/swing double-bend spout and vandal proof 2-3/8" lever handles and Chicago faucet Model 748-665-ABCP or approved equal deck-mounted bubbler. Provide inline water filter on domestic cold water line.

PART 3 EXECUTION

3.01 INSTALLATION

1. All fixtures shall be installed after finished surfaces are complete; they shall be set neat and flush without damage to adjacent surface.
2. All equipment shall be installed in a neat workmanlike manner.
3. All floor mounted fixtures to be set on silicone caulking as further waterproofing.

END OF SECTION
15450.6362

SECTION 16100 - GENERAL ELECTRICAL

1. GENERAL PROVISIONS

- 1.1 The applicable provisions of the Division 1 General Conditions, Supplemental Conditions, Special Contract Requirements, Amendments and Additions to the General Conditions, and all project addenda are hereby made an integral part of this section.
- 1.2 These specifications apply to all electrical work performed.
- 1.3 When apparent conflict exists between these specifications and the contract drawings, within the specifications, or within the drawings, the engineer will determine the intent.
- 1.4 The term "provide" means "furnish and install". The terms "contractor", "E.C.", and "EC" mean "electrical contractor", unless otherwise noted. All work indicated in specifications division 16000 and on the electrical drawings is by the electrical contractor, unless otherwise noted.
- 1.5 The terms "unless otherwise noted" or "unless otherwise indicated" in any form of wording mean "unless specifically indicated otherwise on the electrical drawings, in the electrical specifications, or in the General Conditions and Requirements to the specifications and/or contract". These terms do not mean "unless indicated otherwise on the general construction, mechanical construction, or other disciplines' drawings or specifications", except where specifically so worded on the electrical drawings or electrical specifications.
- 1.6 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc. Where multiple manufacturers are shown in the drawings and/or specifications, not all manufacturers shown may be capable of providing materials and equipment meeting the specifications, field conditions, etc.. Manufacturers not specifically shown on the drawings or specifications shall be considered, provided the products are equivalent or superior to the requirements of the drawings and specifications (including equivalent or superior to products and/or manufacturers specifically shown on drawings and specifications). Manufacturers, whether shown on the drawings or specifications or not, are acceptable only if they can meet the specifications, conditions, and requirements specific to this project. The terms "equivalent", "equal", "equaling", and "approved equal" mean "equivalent or superior to the item/process specified when approved by the engineer", unless otherwise noted.
- 1.7 For any equipment indicated on the drawings or specifications as furnished by the owner (or furnished by any other party, including other contractors, subcontractors, or third parties), contact the furnishing party prior to submitting bid to obtain all requirements of such equipment as necessary to provide a complete installation. Provide all ancillary equipment as necessary which is not furnished but which is required for a complete installation of owner furnished equipment.

2. SCOPE OF WORK

- 2.1 The work governed by these specifications consists of providing all labor, materials, equipment, services, and related items/work necessary to complete all the electrical work as indicated and described in the drawings and specifications.

SECTION 16100 - GENERAL ELECTRICAL

2.2 Electrical work includes but is not limited to:

- A. Electric service and service equipment
- B. Power distribution and wiring
- C. Interior and exterior lighting
- D. Emergency lighting
- E. Utilization equipment connections
- F. Fire alarm system
- G. Telephone raceway/pathway system
- H. Temporary power and lighting

3. CONTRACT DRAWINGS AND SPECIFICATIONS

3.1 Drawings are diagrammatic and indicate the general arrangement of the various systems and approximate and relative locations of the materials and equipment defined by the specifications. Coordinate with and obtain the approval of the owner, architect, and engineer for the exact locations of all materials and equipment. Check the drawings, specifications, and all fabrication and shop drawings (including fabrication and shop drawings of other trades) to verify space conditions, headroom requirements, characteristics, and for coordination. Where space conditions and headroom requirements appear inadequate, notify the engineer before submitting a bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance for failure to notify the engineer, or for any alleged misunderstanding of the requirements above. Completely furnish, install, connect, and interconnect all components of all systems in accordance with contract requirements, manufacturer's instructions, applicable codes and standards, and best practices of the trade.

3.2 Minor deviations, variations, changes, and corrections from layouts shown on the drawings (based on coordination, conditions, manufacturer's instructions, codes and standards, shop drawings, and verification of measurements and conditions) are permitted to facilitate construction provided the changes do not represent potential changes in scope of work (see the section of these specifications "Changes to the Scope of Work") and provided the changes are acceptable to the owner, architect, and engineer.

3.3 Before submitting bid, examine and check all drawings and specifications relating to all work, including electrical, mechanical, plumbing, general construction, fire protection, and any other trades' drawings and specifications (as well as Division 1 General Conditions) and become fully informed as to the extent and character of work required and its relation to the work of other trades. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any alleged misunderstanding of the work to be performed, or the force and intent of these specifications.

4. VISIT TO SITE

4.1 Before estimating work, visit the project site and verify all measurements and field conditions affecting the work. The contractor is fully responsible for the correctness of all

SECTION 16100 - GENERAL ELECTRICAL

measurements and for any connections to existing work. Submission of bid is considered evidence that this contractor has visited and examined the site. No extra consideration, claims, charges, or compensation will be granted under any circumstance for extra work as a result of the contractor's failure to visit the site or verify conditions and measurements.

5. VERIFICATION OF MEASUREMENTS AND CONDITIONS

- 5.1 The electrical contractor is solely responsible for verifying field measurements, conditions, and drawing and specifications information (for all trades) before ordering materials and equipment and before commencing work. The electrical contractor is solely responsible for verifying shop drawings (including shop drawings of other trades) before releasing related materials and equipment and before rough in. No extra consideration, claims, charges, or compensation will be granted under any circumstance due to any differences between the actual dimensions and any dimensions indicated on the drawings.
- 5.2 Report any apparent discrepancies or conflicts found at once to the engineer for consideration and wait for a decision before proceeding with any work in the affected area.
- 5.3 The engineer's decisions in cases of discrepancies, conflicts, and related to verification of measurements and conditions are final and binding upon the contractor, make all installation accordingly.

6. EXISTING CONDITIONS AND UTILITIES

- 6.1 Information and data indicated on the drawings regarding existing conditions (including underground utilities) is from the best available sources. However, no assurance is made as to completeness and/or accuracy.
- 6.2 Contact all utility companies operating in the project vicinity (water, gas, sewage, electric, telephone, cable television, etc.) and the owner's maintenance department (where applicable) and verify all existing underground systems before any excavation commences. Utilize applicable "one-call" or "before you dig" utilities marking services, including paying all associated fees.
- 6.3 Relocate any existing underground electrical feeders and wiring in areas of construction and around proposed foundations as applicable. Include all costs in bid. If any third-party owned wiring or equipment interferes with construction, notify the engineer.

7. ITEMS NOT SHOWN OR SPECIFIED

- 7.1 Provide any items of material not indicated on the drawings and/or not specified, but which are required for the complete and proper installation and/or operation of any part of the work, as if indicated and specified.
- 7.2 Provide any work not indicated on the drawings and/or not specified, but which is required for compliance with applicable codes and regulations, as if indicated and specified.

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- 7.3 No extra consideration, claims, charges, or compensation will be granted under any circumstance for performing work required for complete and proper installation/operation or required for compliance with applicable codes and regulations.

8. REGULATIONS AND CODES

- 8.1 Perform work in accordance with all respective requirements of the latest adopted editions (as of the date of electrical construction permit approval) of all applicable federal, state, and local codes, standards, regulations, ordinances, laws, etc. and industry standards. This includes applicable requirements of the National Electrical Code (NEC), National Fire Protection Association (NFPA), American National Standards Institute (ANSI), Americans with Disabilities Act (ADA) (as well as all related state disabled access and/or barrier free codes and standards and ANSI A117.1), International Building Code (IBC), International Energy Conservation Code (IECC), International Residential Code (IRC), Factory Mutual (FM), Illuminating Engineering Society of North America (IES, IESNA), Institute of Electrical and Electronic Engineers (IEEE), Insulated Power Cable Engineer's Association, National Electrical Contractors' Association (NECA) "Standard of Installation", National Electrical Manufacturer's Association (NEMA), National Electrical Safety Code (N.E.S.C.), Underwriter's Laboratories (UL), United States Department of Labor Occupational Safety and Health Administration (OSHA), utility companies requirements, etc..
- 8.2 Where listing or labeling (in any form, i.e. UL, CSA, ETL, etc.) is indicated in the drawings or specifications or is otherwise required by the NEC or other applicable code, provide equipment and materials as either listed or labeled by a qualified product evaluating organization (UL, CSA, ETL, or approved equal) acceptable to local authorities having jurisdiction. Include all costs in bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with providing listed equipment.
- A. The electrical contractor is fully responsible for verifying (before submitting bid) the applicability and extent of code required listing with local authorities. Specifically verify if the municipality has any requirements that "listable" (capable of being listed) products must be "listed". Provide accordingly where applicable.
- B. Submission and/or approval of shop drawings (which may or may not show listing) do not relieve the contractor of the responsibility to meet listing requirements.
- C. Where products required (by specifications/code) as listed are installed without listing or as non-listed (without prior written approval), the contractor shall remove the products and install listed products at no cost to the owner. Written approval will only be considered if all of the following are satisfied:
- 1) The contractor is fully responsible for (including all costs) and must prepare and submit any and all information necessary for review and evaluation of products (by the authority having jurisdiction, engineer, architect, and owner). This includes all processing costs for all parties involved and costs for any

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special or independent third party inspections, investigations, evaluations, engineering services (including sealing by a registered professional engineer), etc. which may be required or requested in conjunction with approval. In the absence of listing, the contractor is fully responsible for proving that products are acceptable.

- 2) The contractor must show one (1) or more of the following:
 - a) That listed products are not available.
 - b) That providing available listed products involves excessive costs or hardships.
 - c) That listing of products involves requirements that unreasonably exceed the requirements of the specifications, codes, and project conditions.
- 3) Products must meet or exceed all specified requirements, industry standards, code requirements, and conditions specific to the project.
- 4) There must be no change in contract price (except that the owner reserves the right to require credit pricing).
- 5) Where acceptable to the owner.

8.3 Where NEC article numbers are referenced in the drawings and specifications, they apply to the latest edition. Where the authority having jurisdiction has not adopted the latest edition, refer to the corresponding applicable code requirement article.

9. PERMITS, CERTIFICATES, AND FEES

- 9.1 Apply for, obtain, pick-up, and pay for (pay all costs associated with) all permits, licenses, certificates, etc., required for execution of the project. Procure all permits immediately upon notice to proceed with the contract. The contractor is fully responsible for verifying all permits, licenses, certificates, etc. which are required. Submit (see the section of these specifications "Summary of Submissions") copies of all permits, licenses, certificates, etc. in conjunction with this project for record. Prepare all information and data for submittal to any authority in order to obtain permits and certification of compliance for the permits. This specifically includes this contractor reproducing contract drawings for permit submission, which shall be sealed by the electrical engineer upon request.
- 9.2 Obtain and submit (see the section of these specifications "Summary of Submissions") six (6) copies of inspection certificate(s) from authorities having jurisdiction indicating approval of the electrical installation. Arrange and pay for all electrical inspections (performed by an approved Underwriters Inspection Agency) associated with inspection certificate(s).
- 9.3 Applicable utility service charges will be paid directly by the owner. Obtain and submit (see the section of these specifications "Summary of Submissions") written estimates from all respective utility companies prior to utilities performing work.
- 9.4 If and when requested by the owner or owner's representative, the electrical contractor shall submit to the owner any information necessary as part of the owner's application or

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submission for applicable grants, rebate programs, reimbursement programs (including, but not limited to, energy rebate programs such as "smart start" or "clean energy"), or other similar/related programs. Submit all required documentation, including, but not limited to, detailed pricing information on materials and/or labor, bills of materials, invoices, receipts, counts, take-offs, other related cost information, submittals, shop drawings, etc.. Compile information in format as directed by the owner or owner's representative including tables and other formats accordingly.

10. GUARANTEE AND WARRANTIES

- 10.1 The electrical contractor is fully responsible to guarantee all electrical equipment and work (applies to all materials and equipment, including lamps for luminaires) and is fully responsible for all manufacturers' warranties from material purchase (by the contractor), through the date of final acceptance by the owner, to the expiration date(s) of the guarantee and warranties. Guarantee and provide warranties for a period after the date of final acceptance by the owner as per Division 1 General Conditions, unless longer periods are specifically indicated otherwise on the electrical drawings or specifications. Guarantee/warranty periods of less than two (2) years after date of final acceptance are not permitted under any circumstance.
- 10.2 Wherever "warranties" are indicated elsewhere in the specifications, provide and submit (see the section of these specifications "Summary of Submissions") written manufacturers' warranties for equipment. Include all costs in bid associated with providing specified warranties periods (including purchasing any required extended or special warranties to meet the specified periods). Submission of written warranties showing periods, conditions, or coverage of less than the periods, conditions, and coverage specified does not relieve the contractor or manufacturers' of the responsibility to provide warranties with periods, conditions, or coverage as specified. Manufacturers' warranties do not relieve the contractor of any responsibility associated with the electrical contractor's guarantee.
- 10.3 The electrical contractor shall guarantee and respective manufacturers shall warranty equipment and materials from defects in workmanship, materials, and operation. Provide guarantee/warranties including all service, maintenance (excluding routine maintenance), materials, labor, travel, all other work, and all expenses required as part of guarantee/warranties. Provide all guarantee/warranties service at no extra cost to the owner under any circumstance. Provide all guarantee/warranties service in timely manner.
- 10.4 Completely replace or repair, to the satisfaction of the owner, any equipment (as part of this project) improperly installed or damaged before or after installation until expiration of the guarantee period. Completely replace or repair, to the satisfaction of the owner, any equipment (including existing equipment and equipment installed by any other contractor or party) damaged by the electrical contractor (or any subcontractor thereof).

11. SEQUENCE OF WORK

- 11.1 Perform work in areas or general sequences (including applicable project phasing) as determined and directed by the owner and architect. Submit (see the section of these specifications "Summary of Submissions") a complete schedule of construction for approval, showing delivery of equipment, erection of equipment, pertinent work related to

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installation, and when equipment will be placed in operation. Fully coordinate exact sequencing, phasing, and scheduling with all contractors, the architect, and the owner in detail and obtain approval of sequencing, phasing, and scheduling before starting work.

- 11.2 Perform all work in such a manner and associated with sequencing, phasing, and scheduling as applicable and include all costs and manpower allocations in bid. For example, to complete a particular sequence or phase of the work, it may be necessary to perform work in physical areas of the project areas which are covered by and/or part of prior phases or subsequent phases of work (i.e. work in initial phases of the project may involve installing the electrical service and electrical distribution equipment in areas which are proposed for renovation as part of a later phase; this would require installing the electrical service and electrical distribution equipment as part of the initial phase). Verify all such conditions, implications, requirements and include costs in bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance for sequencing, phasing, and scheduling.
- 11.3 Maintain service at all times (except as provided elsewhere in the drawings and specifications for shutdowns) and minimize disruptions to all active areas, activities, and operations in and around the scope of work. This specifically includes activities and operations of the owner, third parties in the vicinity of the project, roads and highways surrounding the project, and utility companies serving the project. Coordinate specific requirements with the owner before submitting bids.
- 11.4 Maintain service of life safety systems (specifically emergency lighting and fire alarm) at all times.
 - A. As a minimum, maintain the following during construction (except brief periods, not exceeding one (1) working day, while making connections to or transitions between existing, proposed, and temporary systems [where applicable]):
 - 1) Maintain code compliant emergency lighting in all occupied areas of the building. Emergency lighting is not required in unoccupied areas and other areas closed to use by building occupants.
 - 2) Maintain manual fire alarm operation throughout the entire building (including areas under construction). This includes manual pull stations (existing, proposed, and/or temporary) at all active building means of egress exits (i.e. exits from each floor to stairwells or the exterior). This includes audible signaling devices to adequately warn building occupants and construction personnel (visual signaling is not required and signaling is not required to comply with the ADA during construction).
 - 3) Maintain supervision of all active sprinklers in the building. This includes monitoring flow, tamper, and pressure switches.
 - 4) Maintain service to automatic fire detection as much as practical. Automatic fire detection is not required to operate in areas of construction at times when construction personnel are present (who can activate manual fire alarms). Other shutdowns of automatic fire detection may be considered, if approved in writing by the owner.

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- 4) Whenever ADA approved signaling is not operational during construction, the electrical contractor's construction personnel shall be instructed with and shall carry out procedures to manually notify any disabled building occupants of fire emergencies (*this provision does not apply if the existing fire alarm system is not ADA compliant or is not present*).
 - 5) Whenever HVAC duct smoke detection systems are not operational during construction, the electrical contractor is responsible for maintaining clear and unobstructed access to HVAC controls and/or disconnecting means (to facilitate manual operation in the event of a fire).
- B. To satisfy requirements above, any existing and proposed life safety systems may be used as much as practical. Where requirements cannot be satisfied using existing/proposed systems, provide suitable temporary life safety systems (including all associated temporary wiring) as applicable.
- C. Whenever unable to meet the above requirements, the electrical contractor (at the electrical contractor's expense) shall provide continuous fire watch.

12. CHANGES TO THE SCOPE OF WORK

- 12.1 Changes to the scope of work include any change effecting the overall nature or cost of the project. Examples of changes to the scope of work include, but are not limited to, additions or deletions of equipment or items of work, substitutions not equivalent or superior to equipment specified, substitutions with characteristics or operation varying from equipment specified, changes which effect the ultimate use or functioning of equipment or areas of the building, changes considered to be "substantial", any change which any party (contractors, sub-contractors, owner, architect, engineers, etc.) believes may involve a possible change in contract price, etc..
- 12.2 Make all changes to the scope of work in complete accordance with the general conditions of the specifications. Submit (see the section of these specifications "Summary of Submissions") changes to the scope of work immediately upon proposal of changes. Do not proceed with any work associated with or affected by changes to the scope of work unless the owner approves changes in writing or authorizes proceeding in writing.
- 12.3 All applicable provisions of the contract drawings and specifications, including addenda and prior changes, apply to all changes to the scope of work, unless specifically indicated otherwise.
- 12.4 In addition to all requirements of the general conditions, submit all pricing related to changes to the scope of work as indicated below. Pricing will not be reviewed until the required breakdowns (summarized below) are submitted.
- 12.5 Submit pricing for a proposed change to the scope of work with detailed breakdown as follows.
- A. Submit a complete detailed breakdown of all material associated with the proposed change in scope of work. Itemize each unit of material and the respective cost.

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- B. Submit a complete detailed breakdown of all labor associated with each respective item of the above material breakdown. Itemize labor hours and classification for each item of material. Summarize total labor costs, broken down by worker classification and/or billing rate.
- 12.6 Where instructed to proceed with a change to the scope of work on a time-and-material (T&M) basis, submit pricing with detailed breakdown as follows.
- A. Submit a complete detailed breakdown of all material. Submit copies of all receipts, invoices, and stock material lists.
 - B. Submit a complete detailed breakdown of all actual labor hours. Submit copies of time sheets. Summarize total labor costs, broken down by worker classification and/or billing rate.
13. TEMPORARY POWER AND LIGHTING
- 13.1 For this specification section only, the term "responsible" (in any form) means "responsible to pay all costs (pay to the electrical contractor) to erect the described work". For this specification section only, the term "erect" (in any form) means "furnish, install, maintain, and remove".
- 13.2 The electrical contractor is responsible for temporary power and lighting service/source and distribution during construction. Provide service capacity sufficient for construction. Provide service including any required utility or private metering.
- 13.3 The electrical contractor is responsible for all temporary lighting, all 120 V power for small construction tools, and all other temporary power not exceeding 120 V or 20 A. Power for large tools and equipment exceeding 120 V or 20 A (including arc welders, etc.) is the responsibility of the contractor requesting such power. Temporary power during construction (exceeding 120 V or 20 A) to permanent equipment installed as part of this project (for installing, testing, operating, etc., including mechanical equipment, elevators, etc.) is the responsibility of the contractor requesting such power.
- 13.4 Where a general contractor's construction trailer is present, the electrical contractor is responsible for a minimum 60 A, maximum 200 A single phase service to the trailer. Provide service including any required utility or private metering. Temporary service to any other contractor or subcontractor trailer is the responsibility of the contractor requesting such service.
- 13.5 Where utility power is not available and during shutdowns of utility power, the contractor requesting power under these conditions is responsible for providing portable generator(s), associated temporary wiring, and fuel (sufficient to meet power requirements during these conditions). Generator power to owner loads during construction is not required (unless specifically indicated on the drawings).
- 13.6 The electrical contractor is responsible for temporary power to existing and/or other owner loads, equipment, and wiring as indicated on the drawings.

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- 13.7 The electrical contractor shall erect all temporary power equipment and wiring for a complete temporary power installation, regardless of the contractor who is responsible for the temporary power.
- 13.8 Erect all temporary power and lighting during construction in accordance with OSHA and the NEC. This includes required ground fault circuit interrupter (GFCI) protection for personnel and "assured grounding program".

14. TESTING

- 14.1 After completing installation of equipment and wiring and prior to energizing or placing in service, test all electrical equipment, conductors, systems, and each and every part thereof to insure continuity, proper splicing, freedom from unwanted grounds, acceptable insulation values, proper operation and functioning, and a complete workmanlike installation to the satisfaction of the engineer and owner.
- 14.2 Completely test all equipment installed. This includes all equipment furnished and installed by the electrical contractor as well as equipment furnished by others and installed by the electrical contractor and equipment furnished and installed by others and wired by the electrical contractor.
 - A. Visual and mechanical checks are required for all equipment (including all panels, switches, circuit breakers, motors, motor starters, and all other equipment) without exception.
- 14.3 Test all equipment and wiring as per the latest edition of InterNational Electrical Testing Association (NETA) standards (Acceptance Testing Specifications (NETA-ATS) for new equipment/wiring and Maintenance Testing Specifications (NETA-MTS) for existing equipment/wiring), unless indicated otherwise. For each piece of equipment, perform testing as shown for that equipment in respective NETA standards. Where equipment is not specifically shown in NETA standards, perform testing as shown for equipment most closely resembling the equipment to be tested. Perform all tests shown in respective NETA standards, unless indicated otherwise. Tests shown as "optional" in NETA standards are not required unless specifically indicated otherwise on the drawings or specifications. Utilize suitable instruments in making all tests, as per NETA standards. Battery, magneto, or similar hand-held testers may be used for preliminary conductor continuity checking but are not acceptable for final results, which must be obtained utilizing proper equipment only (i.e. meg-ohm meter, etc.).
- 14.4 Provide all testing performed by a NETA accredited independent testing firm employed by the electrical contractor, unless indicated otherwise. Provide visual and mechanical checks shown in the NETA standards, testing of transformers 225 kVA and less (with primary and secondary voltages 600 V and less only), and testing of panels, switches, and circuit breakers 1,200 A and less and 600 V and less performed by the electrical contractor's direct employees or by the independent testing firm (at the contractor's option). Provide continuity and insulation resistance meg-ohm meter testing of 600 V and less conductors performed by the electrical contractor's direct employees only.

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- 14.5 If requested by the owner or engineer, utilize a recording type (i.e. "Dranetz") meter to measure phase-to-phase voltage, phase to neutral voltage, phase currents, harmonic content, and surges in the system. Perform testing for a period of one (1) week. Completely set up and take down meter and submit printout tapes formal test results.
- 14.6 For all testing performed, submit (see the section of these specifications "Summary of Submissions") complete typewritten and tabulated test results for review and approval by the engineer and owner. Submit test result bound together in a single three-ring binder (one (1) binder per set of test results) including a table of contents. Submit quantity of sets as directed in the General Construction specifications, but in no case less than three (3) sets. Submit results upon project completion, except under conditions below.
- 14.7 Where any abnormal, questionable, "failing", or "borderline" test results are encountered or where discrepancies are noted during testing, submit results immediately to the engineer before energizing equipment. Do not energize until authorized in writing by the engineer. Test results submitted under these circumstances are not required to be bound or complete.
- 14.8 Where connecting to or otherwise modifying existing wiring, test wiring as follows.
- A. Test existing wiring before performing work to confirm integrity (where testing is performed, the electrical contractor is not responsible for the prior existing condition of wiring).
 - B. Test new wiring before connecting to existing wiring.
 - C. Test connections of new to existing wiring (test new wiring and existing wiring together) and modified existing wiring after performing work.

Where this testing is not performed, the condition of existing wiring will be assumed to be a direct and sole result of work performed and the electrical contractor will be held fully responsible for the condition of existing wiring. Where this testing is not performed and where existing wiring is not in acceptable condition for maintained use or service, the electrical contractor shall repair or replace wiring to the satisfaction of the owner at no cost to the owner.

15. SUBSTITUTIONS

- 15.1 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc.. The engineer will consider substitutions of similar equipment superior to specified equipment (meeting or exceeding all characteristics of the specified equipment).
- 15.2 Submit shop drawings associated with substitutions complete with documentation necessary to establish compliance with the specifications (see the sections of these specifications "Shop Drawings" and "Summary of Submissions"). Submit samples of substitutions where requested (see the sections of these specifications "Samples" and "Summary of Submissions"). If documentation and/or samples are not submitted when required, the substitution will be denied.

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- 15.3 Determination of compliance with specifications rests with the engineer. When a request for substitution is denied, furnish the equipment specified. The engineer's decisions in cases of substitutions are final and binding upon the contractor, provide equipment accordingly.
- 15.4 Pay all costs associated with a substitution where granted. For the provisions of this section, "substitutions" includes equipment where characteristics or operation vary significantly from equipment specified (including equipment of the specified manufacturer). This includes costs incurred by any party (electrical contractor, other contractors, sub-contractors, owner, architect, engineers, etc.), costs resulting from differences of details, configuration, ratings, operation, characteristics, and dimensions between the specified and substituted equipment, costs to provide features of the specified equipment which may be manufacturer's options of the substituted equipment, and costs to remove and replace work already installed and any other remedial work as a result of substitutions. Approval of substitutions is conditional upon there being no cost change to the contract, unless specifically indicated on the shop drawings submittal and corresponding approval. The electrical contractor is fully responsible for coordinating with the owner, architect, and other trades to identify all possible cost impacts associated with any substitution before releasing equipment and before any party proceeds with work effected by the substitution.
- 15.5 Submit bid based on the items as specified. Substitutions will be considered only after a contract has been awarded.

16. SHOP DRAWINGS

- 16.1 Submit a product list indicating all proposed items of products, materials, and equipment as directed in the general construction specifications.
- 16.2 Submit (see the section of these specifications "Summary of Submissions") shop drawings of all equipment and materials proposed to be furnished for review and approval by the engineer. Submit quantity of sets as directed in the general construction specifications.
- 16.3 Submit shop drawings for all equipment and materials including, but not limited to luminaires, raceways, conductors, cable, termination methods, grounding, wiring devices, safety switches, enclosed circuit breakers, branch and distribution panels, contactors, , fire alarm system, emergency lighting, engraved plastic nameplates, and any other items requested by the owner, architect, any code official, or engineer. Submit detailed computer-generated illumination foot-candle calculations for luminaires where requested by the architect, owner, or engineer.
- 16.4 Stamp or mark shop drawings with the contractor's approval, as evidence that they were checked for accuracy and that all dimensions, characteristics, ratings, operation, features, data, relation to existing conditions, and coordination with work and shop drawings of other trades were completely verified before submission. Approval of shop drawings by the engineer does not relieve the contractor of responsibilities to review shop drawings in detail, to comply with drawings and specifications, for errors contained in shop drawings, for coordination, and to provide equipment as listed.

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- 16.5 Where any characteristics, ratings, operations, or features differ from the specified equipment (where not equivalent or superior to the characteristics, ratings, operations, and features of the specifications and specified equipment), circle, highlight, or otherwise clearly designate and identify the specific differences.
- 16.6 In the event that shop drawings are not acceptable to the engineer (including as provided below for conditional approval), submit acceptable shop drawings within seven (7) days of notification.
- 16.7 Approval of shop drawings, including approval of substitutions, is conditional that there is no cost change to the contract, unless specifically indicated on the shop drawings submittal and corresponding approval.
- 16.8 Approval of shop drawings is conditional upon the contractor fully and completely complying with all review comments by the owner, architect, and engineer. Where the contractor fails to or is unable to fully and completely comply with every review comment, then the shop drawings are *disapproved* (whether or not they are stamped or noted as "approved" in any manner in any review comment) and must be resubmitted as within seven (7) days (as indicated above). Immediately upon receipt of shop drawing review comments, the contractor is responsible for carefully reviewing all comments in detail and for complying with comments. Where unable to fully satisfy any comment or where the contractor takes exception to any comment, revise and resubmit acceptable shop drawings (or, where taking exception, notify the engineer in writing) within seven (7) days. Where the contractor fails to comply with these requirements (including resubmitting/notifying within the seven (7) day period specified), the contractor shall provide acceptable equipment meeting all specified requirements and all review comments (including removing unacceptable equipment [if installed] and replacing with acceptable equipment) at no cost to the owner.
- 16.9 Do not release equipment until shop drawings are approved. The electrical contractor is responsible for all changes where equipment is released before approval and/or where equipment does not comply with all approval conditions.
- 16.10 In addition to the quantity of shop drawings submitted for approval (see above), submit one (1) copy of *approved* shop drawings to the general contractor, the mechanical contractor, and each other contractor and trade for review and coordination. The electrical contractor is not required to submit copies direct to subcontractors or vendors to other contractors (this is the other contractors' responsibility). The electrical contractor is responsible for all changes and other costs where the electrical contractor fails to submit shop drawings to other parties for coordination.
- 16.11 Obtain copies of all shop drawings relating in any way to electrical work from all other contractors, subcontractors, and trades. Review shop drawings and coordinate with electrical work. Notify the architect and engineer immediately where discrepancies are found. The electrical contractor is responsible for all changes and other costs where the electrical contractor fails to obtain shop drawings or fails to coordinate shop drawing information. Approval of other trades submittals by the architect or engineers (or lack of review by the architect or engineers) does not relieve the electrical contractor of the responsibility to review other trades shop drawings in detail and for coordination.

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- 16.12 No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with any party's failure or delay in properly submitting, transmitting, obtaining, reviewing, and/or coordinating shop drawings.

17. SAMPLES

- 17.1 Submit (see the section of these specifications "Summary of Submissions") samples of materials and equipment for approval only where specifically requested by the owner, architect, or engineer. Submit samples along with complete catalog data, installation instructions, operating and maintenance (O&M) information, etc. specifically applying to the samples submitted, to facilitate proper evaluate the quality of the sample. Specifically designate and identify each sample as to the service and location where each sample is to be used on the project.
- 17.2 Submit samples within 30 days of request, except where the sample is for a substitution. Where sample is for a substitution, submit samples within seven (7) days of request.

18. AS-BUILT DRAWINGS, MANUALS, AND DEMONSTRATION

- 18.1 Prepare and submit (see the section of these specifications "Summary of Submissions") as-built record drawings showing conditions exactly as installed.
- A. Indicate the exact locations and elevations of all equipment and devices and underground, concealed, and hidden work (including raceways, junction and pull boxes, etc.).
 - B. Indicate exact layout, connections, and conductor routing for all grounding.
 - C. Indicate all substitutions and changes, including updated lighting fixture/luminaire schedule, symbol list, list of alternates, etc..
 - D. For underground work, specifically indicate exact conditions accurately. Where underground wiring does not run straight and direct between visible and obvious equipment, objects, or markers (i.e. markers specifically placed to identify underground work [specifically note the presence and approximate location of all markers on as-built drawings]), clearly, accurately, and exactly *mark* and *dimension* exact underground work (including all bends) from visible permanent landmarks. Acceptable visible permanent landmarks include building walls, retaining walls, curbs, foundations, pole bases, etc.. Lines, joints, and markings on pavements are not considered permanent (since they would be covered by re-paving). Acceptable markers for placement to identify underground work include a 0.9 m (3'0") long piece of 102 mm (4") conduit installed vertically in the ground (top flush with grade) completely filled with concrete (or other similar means providing equivalent or superior visibility, durability, and permanence approved by the engineer). Where the contractor does not include this exact marking/ dimensions on as-built drawings or where marking/dimensions are inaccurate (allowing for a tolerance of not greater than 0.6 m (2'0") away from actual locations), the electrical contractor will be held

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responsible if underground facilities are damaged in the future (where due to lack of or inaccurate marking/ dimensioning).

- 18.2 During the progress of work, maintain accurate records of all deviations, variations, changes, and corrections from layouts shown on the drawings/specifications on a "record working" set of drawings and specifications kept at the job site for this purpose.
- 18.3 Upon completion of work, incorporate all information from the "record working" drawings/specifications onto a "marked-up as-built" set of drawings/specifications. Submit the "marked-up as-built" drawings/specifications to the engineer for review, comment, and approval.
- 18.4 Submit operating and maintenance (O&M) manuals for all new equipment furnished as part of this contract. Provide O&M manuals including installation, operating, and maintenance instructions for the equipment. Wherever "proof-of-purchase" is required as part of any manufacturer's warranty (whether manufacturer's warranty is specified or not), submit with O&M manuals. Where any proof-of-purchase is required but not submitted (or where insufficient information is submitted), the electrical contractor is fully responsible and liable for providing the warranty. Submit all O&M manuals bound together in a single three-ring binder (one binder per set of manuals) including a table of contents. Submit quantity of sets as directed in the general construction specifications, but in no case less than three (3) sets.
- 18.5 Explain and demonstrate the complete electrical system and all work installed by the electrical contractor to the owner's operating and maintenance personnel. Demonstration is to instruct owner's personnel in the operation and maintenance of systems as well as to prove to the owner correct and adequate operation of all parts of the electrical system. Provide a demonstration period of one (1) full working day for the general electrical installation (including, but not limited to, contactors, time clocks, customer metering equipment, lighting controllers, dimming cabinets, motor controls [where furnished by the electrical contractor], transformer fan controls, generators, transfer switches, key interlocking schemes, and similar equipment, where applicable). Wherever demonstrations are indicated elsewhere in the specifications for equipment furnished by the electrical contractor (i.e. for fire alarm, dimming, sports lighting, stage lighting, UPS units, MCC's, VFD's, metal clad switchgear, power management, sound/paging, security, CCTV, and similar systems, where applicable), provide the specified additional demonstrations during additional periods of time (above and beyond the period above for the general electrical demonstration). Conduct all demonstrations at the project site and after all systems are fully operational.

19. SUMMARY OF SUBMISSIONS

- 19.1 Submit items as indicated elsewhere in the specifications (applicable sections are shown for convenience) and as summarized as follows. Information below indicates relative schedule of submission.
- 19.2 Submit upon commencement of construction (as per general construction specifications); resubmit within seven (7) days of notification:

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- A. Permits, licenses, certificates (see 16100-9)
 - B. Schedule of work (see 16100-10)
 - C. Product list (see 16100-17)
 - D. Shop drawings (see 16100-17)
- 19.3 Submit within 30 days of request (within seven (7) days for substitutions):
- A. Samples (see 16100-18)
- 19.4 Submit during the project as applicable (refer to respective specifications sections for conditions and schedule of submission):
- A. Utility service charge estimates (see 16100-9)
 - B. Scope of work changes, w/ breakdowns (see 16100-11)
 - C. Test results, abnormal/failing only (16100-15)
 - D. Short circuit, coordination, and arc flash report (where specified for adjustable circuit breakers)
- 19.5 Submit upon substantial completion of the project:
- A. Approved inspection certificate(s) (see 16100-9)
 - B. Written manufacturers' warranties (see 16100-14)
 - C. Test results (see 16100-15)
 - D. As-built drawings (see 16100-19)
 - E. O&M manuals (see 16100-19)
 - F. Spare parts (where specified elsewhere)
20. SAFETY
- 20.1 Perform all work and work practices in strict accordance with all applicable local, state, and federal codes, standards, regulations, and requirements including OSHA (including the proper use and maintenance of personal protective equipment (PPE) and clothing), state labor and industry, the NEC, ASTM, the National Electrical Safety Code, NFPA, etc..
- 20.2 The term "live" means "energized or capable of being energized at any time for any reason, either intentionally or accidentally".
- 20.3 Suitably protect all live equipment against accidental contact at all times. Install and maintain covers on all live equipment. Where covers are not installed, provide suitable insulating barriers at all live parts. Suitable barriers include arc-resistant NEMA GPO-2 or GPO-3 and UL 94 V-0 electrical grade fiberglass reinforced epoxy compound sheets, rubber insulating blankets, suitable thermoplastic insulating materials, etc. as per OSHA, ASTM, and the NEC. Cardboard and similar materials are not acceptable. Provide listed OSHA approved signs reading "Danger: High Voltage" at locations of live parts and on doors/gates leading to rooms/fences/areas containing the equipment and keep doors/gates locked at all times.
- 20.4 Protect and enclose equipment operating at over 600 V at all times. Equipment is considered adequately protected where all requirements of NEC Articles 110.26 through

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110.34 (including all other articles and codes referenced therein) are satisfied at all times. Where equipment must be exposed for work, or where work is to be performed around normally exposed live parts, provide suitable insulating barriers (suitable for the voltage involved), listed warning signs, and door/gate locking, etc. as shown above. Provide listed OSHA approved warning tape (reading "Danger: High Voltage") around the equipment and all code required working spaces at equipment.

- 20.5 When working on equipment or wiring, properly identify and use lockout devices and tags (in accordance with OSHA requirements) to prevent unauthorized or accidental energizing of equipment and wiring.
- 20.6 Perform all work in or associated with confined spaces (including manholes, hand holes, vaults, crawl spaces, etc.) in accordance with all safety codes referenced above. Obtain appropriate permits where required by the above codes and/or the owner.
- 20.7 Perform all excavation and work in and associated with excavation in accordance with all safety codes referenced above (include all required sloping, benching, shoring, bracing, supporting, shields, protective systems [fall protection, protection of personnel in excavation, protection of structures, etc.], ramps, access/egress, warning systems, rescue equipment, etc.). Provide suitable barricades and safety procedures to restrict pedestrian and vehicular access to areas where work is being performed (including open excavations, lay-down areas, clearance space around operating excavation equipment, etc.). Do not leave excavations open when not actually performing associated work (including at night, during weekends, or when working away from excavations). Leaving excavations open for short periods of time will be considered only when approved in writing by the owner and only where suitably protected. Any request for approval must include a written plan on proposed protection and safety procedures. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any multiple excavations and backfilling needed to satisfy safety requirements.
- 20.8 When working in, on, or near areas subject to vehicular traffic (including public and private roadways, driveways, parking lots, etc. and including loading and unloading equipment/materials in the vicinity of traffic), perform all work and provide appropriate work zone traffic control in accordance with all safety codes referenced above as well as state department of transportation regulations, requirements, and recommendations. Where requested by the owner, architect, or engineer, submit a traffic control plan detailing proposed work zone traffic control and associated safety procedures.

21. HAZARDOUS MATERIALS

- 21.1 The electrical contractor is not responsible for and is not required to remove equipment contaminated by hazardous materials, except as indicated below. For this specification section, the term "hazardous material(s)" applies to any materials classified by federal, state, or local authorities having jurisdiction as environmental or health hazards (including, but not limited to, polychlorinated biphenyls (PCB's), asbestos, mercury, radioactive materials, etc.). For this specification section, the term "contaminated" (in any form) means "contains or is contaminated by hazardous material(s)".
- 21.2 The electrical contractor (and all applicable subcontractors) shall be fully insured for performing all work related to, on, and around contaminated equipment and for all work

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specifically shown in this specifications section as by the electrical contractor. Submit proof of insurance to the owner as part of or along with other applicable insurance submittals (as per Division 1 General Conditions, Supplemental Conditions, and Special Contract Requirements).

- 21.3 Immediately notify the owner if any electrical equipment or wiring to be removed or modified as part of this project is contaminated or suspected as contaminated. Identify all areas where disruptive work is proposed (including, but not limited to, excavation, cutting, penetration, drilling, etc.) in advance of performing work so the owner can arrange to have any necessary abatement completed, include all costs and schedule time accordingly. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any delays resulting from abatement of hazardous materials.
- 21.4 When performing work with, on, and around equipment contaminated or suspected as contaminated, assume that the equipment is contaminated until/unless proven otherwise by testing. Exercise care and suitably guard and protect equipment at all times from the start of work until the equipment is either proven by testing as not contaminated or is removed from the project site.

END OF SECTION

SECTION 16200 - ELECTRICAL WORK PRACTICES

1. GENERAL PROVISIONS

- 1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications division 16100, General Electrical, are hereby made an integral part of this section.
- 1.2 The work governed by these specifications includes but is not limited to that as defined in specifications section "Scope of Work" of specifications division 16100, General Electrical.

2. INSTALLATION

- 2.1 Provide all equipment and materials in accordance with the recommendations and instructions of the respective manufacturers. This includes recommendations and instructions for equipment furnished by other trades or the owner and installed or connected by the electrical contractor.
- 2.2 Perform all work in an approved first class and workmanlike manner and conform to the best practices of the trade and to all requirements of the NEC.
- 2.3 Protect and preserve all existing, new and proposed raceways, wiring, materials, devices, luminaires, and equipment from corrosion, dirt, paint, building materials, acid, solvents, chemicals, water, ice, tools, overload, freezing, heat, combustion, theft, damage, abrasion, inadvertent removal, improper installation (including where installation has not been completely or properly coordinated), conflicts, interference, vandalism, etc. at all times. Repair or replace all equipment and materials lost or damaged as the result of inadequate protection. Cap and plug open ends of raceways and equipment during construction until wiring is ready to be installed.
- 2.4 Coordinate with and obtain approval of the owner and architect for all exact locations of all outlets, raceways, materials, and equipment. Fully determine and coordinate all exact routing of raceways. Determine routing before submitting bid and bid accordingly, including allowance to avoid any obstructions which may be encountered. The contractor is solely responsible for routing (any routing of raceways which may be shown on any electrical drawing is for reference only to show the recommended basis of design and does not relieve the contractor of the responsibility for fully determining/coordinating all exact routing, nor does it preclude the use of alternative routing). Prior to purchasing conduit or prior to any installation, submit detailed sketches/drawings of proposed raceway routing, equipment locations, and all other details of installation (submit in Autocad format as part of the shop drawings process at the same time switchgear submittal is submitted). Fully coordinate layouts with all contractors and trades before submitting and identify any areas of potential conflict. Any raceways routed in a location not previously approved shall be removed and reinstalled by the Contractor at the Contractor's own expense (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with routing of raceways).
- 2.5 Completely coordinate installation and routing of all wiring, materials, and equipment in the field and with shop drawing information of all trades prior to rough in of wiring or releasing equipment. Completely inspect equipment and materials upon receiving in the field (including equipment received by other trades where installed or connected to by the

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electrical contractor) and verify exact installation requirements and details (compare to installation and routing as coordinated above) prior to installing, preparing installation, modifying, or handling in any manner which would restrict the ability to return material or equipment in the event of potential installation complications.

- 2.6 Cooperate and fully coordinate all work with the work of all other trades, contractors, subcontractors, and the owner, including work as part of other contracts and projects related to and/or in the vicinity of the specified work. Coordinate the locations of pipes, ducts, structure, reinforcement, foundation components, floor/wall/ceiling construction, raceways, branch and distribution panels, luminaires, devices, electrical outlets, air outlets, motor controls, and all other equipment in order to avoid conflicts, interference, or placing services at the wrong locations. Coordinate all demolition, disconnection, removals, relocations, extension, and re-feeding associated with existing equipment and wiring. Coordinate with shop drawings of all trades. Install all wiring and equipment in such a way to maintain clearance and clear access to all equipment requiring access by code or for operating, servicing, maintaining, replacing, examining, etc. This includes access to electrical equipment and devices as well as mechanical, architectural, and other equipment including, but not limited to, valves, dampers, sensors, meters, gauges, clean-outs, access doors and panels, operating mechanisms, motors, pumps, fans, air handling and other mechanical equipment, etc.. This specifically includes coordinating wall mounted electrical devices and outlets with wall mounted HVAC equipment (including baseboard, radiation, cabinets, etc.).
- 2.7 Provide all work indicated on the electrical drawings and electrical specifications but involving disciplines of other trades performed by the electrical contractor (or applicable sub-contractors to the electrical contractor), unless specifically indicated otherwise. Perform work in complete accordance with all general construction specifications applicable to the work. This applies to all work including, but not limited to, cutting and patching, excavation, backfill, surface restoration (including paving), concrete, metal fabrication, fire stopping and sealing, painting, etc..
- 2.8 Properly isolate all materials and equipment against the transmission of vibration or noise to, from, or between any parts of the building.
- 2.9 The electrical contractor is fully responsible for determining and verifying all exact details of installation. Where installation details or similar information is shown on the drawings or is otherwise forwarded to the contractor (including during construction), the information represents the minimum criteria required and serves as a guide to the contractor but does not relieve the contractor of the responsibility for determining and verifying installation details.

3. GROUNDING

- 3.1 Completely ground and bond all equipment (specifically including all metallic raceways, cable armor, cladding, and shielding, supports, transformers, cabinets, cable trays, service equipment, and the neutral conductor) in strict and complete accordance with all applicable requirements of the NEC.
- 3.2 Provide insulated grounding conductors run with all wiring.

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- 3.3 Install all metallic raceways in such a way to provide a continuous grounding path without the use of the insulated grounding conductor required above. Include all bonding jumpers and conductors (in addition to the insulated conductor required above) for flexible conduit, loosely jointed raceways, etc.. Provide suitable raceway/conduit fittings for a completely grounded raceway system, including the use of fittings approved and/or listed for grounding, grounding bushings, grounding lock nuts, etc..
- 3.4 Provide all grounding and bonding materials and connections as per specifications section "Grounding Materials" of specifications division 16300, Electrical Materials.
- 3.5 Wherever connections to grounding electrodes or electrode systems are required by code, connect and bond to and interconnect the following.
- A. Provide new driven (made) grounding rod electrodes, for all services and where equipment is located on or below the second floor of a building.
 - B. Connect to the domestic cold water piping system and any other metal piping system where required by the NEC (excluding piping prohibited from bonding/grounding by the NEC).
 - C. Connect to the structural steel and/or metal building frame, where applicable.
 - D. Connect to all existing grounding electrode systems, where applicable.
- 3.6 Wherever the following is installed as part of this project (including where installed by other contractors), connect and bond to the grounding electrode system.
- A. Ground new metal piping systems where required by the NEC.
 - B. Ground new structural steel and/or metal building framing.
 - C. Wherever any new foundation and/or footing is installed with continuous length of 3.0 m (10'0") or more or covering area of 3.3 m² (36 sq. ft.) or more, provide concrete-encased electrode(s) as per NEC Article 250.52(A)(3). Provide consisting of not less than 6.0 m (20'0") of #4 AWG bare copper conductor encased in not less than 50 mm (2") of the foundation/footing concrete, except that concrete reinforcement may be substituted for the copper conductor where the size, length, type, and installation of reinforcement complies with NEC Article 250.52(A)(3) for use as a grounding electrode.
- 3.7 Where driven (made) grounding rod electrodes are installed, provide grounding resistance not exceeding 1.0 ohm (maximum). Verify proper ground resistance by testing as per the section "Testing" of this specifications division 16100. Where the measured resistance exceeds the maximum value, install additional ground rod(s) at the location and/or set ground rods in suitable listed and NEC approved chemical ground enhancement material in order to obtain proper values, include all costs in bid.
- 3.8 Detail all grounding on as-built record documents.

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- 3.9 Wherever new wiring or equipment is installed at or near roofs of buildings with lightning protection system(s), bond wiring/equipment to the lightning protection system(s) as per lightning protection codes and standards.

4. WIRING METHODS

- 4.1 The wiring methods in this section apply to all systems (including power, lighting, emergency, over 600 V, control, telecommunications, data, fire alarm, sound, security, CCTV, and any other system), unless specifically indicated otherwise.
- 4.2 In finished areas, run all wiring hidden or concealed in/behind ceilings, walls, and floors, include all required cutting and patching. In unfinished areas, wiring may run exposed. Run exposed wiring following building lines.
- 4.3 Utilize steel rigid metal conduit (RMC) for all wiring unless indicated otherwise. Utilize only steel RMC for all exposed visible exterior raceways, for raceways in wet locations above ground, for exposed visible raceways in damp locations.
- 4.4 Steel intermediate metal conduit (IMC) may be utilized for all wiring except conditions indicated above as requiring only steel RMC. Steel IMC may be utilized in any condition where PVC RNC is permitted by these specifications.
- 4.5 Where permitted by code, schedule 40 or schedule 80 polyvinyl chloride rigid nonmetallic conduit (PVC RNC) may be used underground. Changing PVC RNC thickness (i.e. from schedule 40 to schedule 80 or vice versa) in the middle of any run of PVC RNC is not permitted.
- 4.6 Where runs of PVC RNC protrude exposed and visible above grade or floors, in indoor or outdoor locations, utilize steel RMC for the portions above grade/floor to a minimum depth of 155 mm (6") below finished grade/floor. This requirement does not apply where protruding PVC RNC is completely concealed/hidden within equipment enclosures, walls, or ceilings. Where exposed visible runs of PVC RNC are installed by the contractor (without prior written approval) the contractor shall remove the PVC RNC and install new steel RMC (including cutting and patching to a minimum 155 mm (6") depth and including replacing or reinstalling conductors) at no cost to the owner.
- 4.7 Where permitted by code, electrical metallic tubing (EMT) may be used for interior feeder and branch wiring in locations not subject to abuse or injury. Utilize steel RMC for conditions indicated above as requiring only steel RMC.
- 4.8 Utilize flexible conduit for flexible connections to motors, equipment requiring flexibility, equipment subject to vibration (including transformers), and where required for adjustment, in lengths not to exceed 1.8 m (6'0"). Flexible conduit may be utilized for flexible connections to luminaires only where wiring is concealed or located above accessible ceilings (in lengths not to exceed 1.8 m (6'0")). Exposed visible flexible conduit is not permitted for luminaires, except adjustable luminaires. Flexible conduit may be used where existing walls are fished in lengths not to exceed the portion in the wall plus 0.9 m (3'0"). Utilize liquidtight flexible metal conduit (LFMC, "sealtite"), unless indicated otherwise. Utilize only LFMC in damp, wet, and outdoor locations, mechanical rooms, and for NEC hazardous (classified) locations (except as indicated below). Utilize flexible metal

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conduit (FMC, "greenfield") in dry locations only (except conditions indicated above as requiring only LFMC).

- 4.9 Where permitted by Code and approved by local authorities having jurisdiction and the owner, metal clad cable (type "MC") may be used for interior branch wiring concealed in walls/ceilings and hidden above accessible ceilings in dry locations only. Where applicable, comply with NEC Article 518 "Assembly Occupancies". Utilize raceway for all feeder wiring (#4 AWG and larger). Type "MC" cables are not permitted in wet, damp, or exterior locations. Type "MC" cables are not permitted in exposed visible locations. Hide cables at panels in electrical rooms and electrical closets as per the section "Branch Panels" of specifications division 16300, Electrical Material. Contact local authorities for approval before submitting bid and include all costs in bid (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with wiring methods not approved by local authorities).
- 4.10 Surface raceway without integral wiring devices is permitted only where all of the following conditions are met or where specifically indicated on the drawings. Surface raceway without integral wiring devices is permitted where physically impossible to run wiring hidden or concealed, where impossible to hide or conceal wiring by cutting, patching, and painting, where approved by code, in dry locations only, and where specifically approved by the owner and architect in writing. Permission to use surface raceway without integral wiring devices is conditional upon there being no cost change to the contract, unless specifically indicated on the written approval.
- 4.11 Nonmetallic-sheathed cable (types "NM", "NMC", and "NMS", i.e. "romex") is not permitted under any circumstance. Electrical nonmetallic tubing (ENT), liquidtight flexible nonmetallic conduit (types LFNC-A and LFNC-B), high-density polyethylene (HDPE) conduit, type "A" nonmetallic conduit, and type "EB" nonmetallic conduit are not permitted under any circumstance.
- 4.12 Provide all wiring within air handling plenum spaces in complete accordance with the NEC. Provide wiring methods utilizing metal conduit raceways (as permitted by the specifications) only. Type "MC" cable, where otherwise permitted, may be utilized in plenum ceilings (but not other plenum spaces).
- 4.13 Provide all systems wiring (including only fire alarm, telecommunications, data, sound, security, and CCTV, where applicable) in complete accordance with all requirements of other sections of the electrical specifications, except as modified below. Where permitted by Code and approved by local authorities having jurisdiction and the owner, suitable code approved systems type cables (without conduit) may be used for interior systems wiring concealed in walls/ceilings and hidden above accessible ceilings in dry locations only. Contact local authorities for approval before submitting bid and include all costs in bid (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with wiring methods not approved by local authorities). Systems type cables without conduit are not permitted in wet, damp, or exterior locations. Systems type cables without conduit are not permitted in exposed visible locations. Run wiring in pathways as indicated on the drawings and specifications.
- A. Provide wiring as directed, recommended, and approved by the respective system manufacturer/utility company and meeting all minimum requirements of the system

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manufacturer/utility (including where manufacturer/ utility requirements exceed the requirements of the specifications and the NEC).

- B. Provide all cables as multi-conductor style having an overall jacket (of a color other than red; red is reserved for fire alarm) and utilize only cables approved by the NEC for use with the system.
 - C. Provide all wiring in plenum spaces in complete accordance with the NEC. In dry location plenum ceilings, utilize only plenum rated cables. For damp and wet location plenum ceilings and in all other duct and plenum spaces, run wiring (utilize a non-plenum type suitable for the damp/wet location) in metal conduit. Plenum rated cables may be utilized for other (i.e. non-plenum) applications, but only in dry locations. Plenum cables, even when installed in conduit, are prohibited in damp and wet locations.
 - D. In damp locations, utilize only cables specifically listed and identified for use in damp or wet locations. Provide all cables in wet locations (including underground and embedded in concrete slabs at or below grade, whether in conduit or direct buried) specifically designed for outdoor and submerged use and specifically listed and identified for use in wet locations.
- 4.14 Except as indicated otherwise on the drawings, 21 mm (3/4") raceways are the minimum permitted. No raceway smaller than 21 mm (3/4") is permitted under any circumstance (except where specifically approved in writing by the owner and engineer for the individual condition encountered). Where luminaires, devices, or equipment have factory knockouts or hubs smaller than 21 mm (3/4") size (or smaller than conduit sizes specified on the drawings), provide suitable reducing conduit fittings or provide field knockouts at equipment to match conduit size.
- 4.15 Except as indicated otherwise on the drawings, #12 AWG conductors are the minimum permitted for power and lighting and #14 AWG conductors are the minimum permitted for control and signal systems. #10 AWG conductors are the minimum permitted for outdoor wiring, night lighting circuit wiring, and emergency power and lighting wiring. #10 AWG conductors are the minimum permitted where circuits exceed 23 m (75'0") for 120/208/240 V circuits or exceed 46 m (150'0") for 277/480 V circuits, measured to the center of the load.
- 4.16 Provide a separate neutral conductor with each branch circuit where a neutral is required or indicated on the drawings. Multi-wire branch circuits with a shared common neutral are not permitted, unless specifically indicated otherwise on the drawings. Utilize multi-wire branch circuits with a shared common neutral conductor for lighting controlled by "dual switching" where the lighting is connected to two (2) circuits.
- 4.17 Multiple branch circuits may be installed in the same raceway (including surface raceways) where permitted by code and provided all of the following conditions (A through D below) are met.
- A. Apply appropriate NEC de-rating factors and adjust conductor sizes accordingly. Wiring sizes indicated on the drawings are based on each circuit run in an individual raceway (and are not adjusted for de-rating factors), except where multiple branch

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circuits in a common raceway are specifically indicated on the drawings (wiring is adjusted for applicable de-rating factors in this case, but only for the specific wiring combination shown on the drawings).

- B. Provide no conductor (after de-rating adjustment) exceeding #10 AWG, except grounding conductors as provided below (or as otherwise specifically approved in writing by the engineer).
 - C. Common equipment grounding conductors are permitted in lieu of individual equipment grounding conductors for each individual circuit. Provide minimum single equipment grounding conductor size two (2) standard wire sizes larger than the size as determined in accordance with the NEC. Provide isolated grounding conductors (where required) individually for each circuit and in addition to common equipment grounding conductors.
 - D. Provide raceway fill (after de-rating adjustment) not exceeding 30% (provide maximum number of conductors permitted not exceeding 75% of the maximum number permitted by Code [i.e. refer to NEC Chapter 9 and Annex C] to allow for future wiring). Adjust minimum conduit size to maintain 30% maximum fill.
- 4.18 Minimum raceway sizes indicated in the specifications and on the drawings are applicable to all conduit types specified, except schedule 80 PVC RNC (unless the drawings specifically indicate schedule 80 PVC RNC). Where schedule 80 PVC RNC is utilized and the specified conduit size is 63 mm (2.5") and smaller, increase conduit to the next higher trade size. Where schedule 80 PVC RNC is proposed and the specified conduit size is 78 mm (3") and larger, submit raceway fill calculations; where raceway fill with the specified conduit size exceeds 40%, increase conduit to the next higher trade size.

5. WIRING INSTALLATION

- 5.1 Securely support and fasten all raceways, cables, outlets, boxes, equipment, etc. in place as per the NEC. Support at intervals as per the NEC, but in no case exceeding 3.0 m (10'0"). Refer to the section of this specification "Fastenings, Supports, and Hangers" for information.
- 5.2 Where any run of wiring passes vertically through more than one (1) floor level (including where installed in open vertical chases), support at every floor level. For conduits 63 mm (2.5") and larger, utilize only suitable pipe riser clamps (B-Line #B3373 series or approved equal), suitable wall bracket offset pipe clamps (NPHC-National Pipe Hanger Corp. figure #430 series or approved equal), or engineer approved heavy duty steel brackets (fabricated of not less than 6.5 mm (1/4") thick steel and of type, design, and arrangement suitable for the specific application and weights involved) for these floor level supports. Conduit clamps and strut type supports are not acceptable for this application. Equipment as manufactured by B-Line, Erico, and NPHC (or approved equal) shall be considered.
- 5.3 Make all changes in direction of 27 mm (1") and larger conduits with standard elbows or case metal fittings. Fabricate field-made bends and offsets in conduit with suitable hickey/conduit-bending machine. Make conduit bends of the long radius type without kinks, flattening or crushing. Do not install crushed or deformed raceways. Avoid trapped

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raceways in damp and wet locations. Exercise care to prevent the accumulation of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Entirely free clogged or obstructed raceways or replace raceways

- 5.4 Provide raceway ends cut squarely and reamed. Provide raceway installation (including pull boxes as applicable) so there is no more than a total of 360 degrees of bends in any run of raceway. Provide pull boxes at intervals not greater than every 30 m (100'0"), unless otherwise indicated on drawings.
- 5.5 Maintain a separation of not less than 155 mm (6") between all raceways and hot water lines, steam lines, and any other surface with temperature exceeding 104 degrees F (40 degrees C), whenever possible. When not possible to maintain the 155 mm (6") separation, provide insulation pipe covering on the electrical raceways.
- 5.6 Provide a suitable insulating or grounding type (as applicable) bushing on each conduit terminating in a pressed steel box and for each conduit stub. Bushing is not required where conduit terminates in a suitable conduit connector/termination fitting which includes an integral bushing or which provides smoothly rounded surface suitable and approved for use without a bushing.
- 5.7 Wherever raceways pass across structure expansion joints, provide suitable conduit expansion fittings. Where expansion fittings are not listed for grounding, provide external flexible copper grounding strap. Wherever expansion fittings are installed, provide a suitable junction box located not farther than 7.6 m (25'0") from the expansion fitting location. Coil suitable slack conductors in this junction box to allow functioning of expansion fittings. For continuous runs of PVC RNC exceeding 27 m (90'0"), provide expansion fittings at intervals not exceeding 15 m (50'0") to compensate for linear thermal expansion and contraction.
- 5.8 Where metal raceway is installed in contact with or entering earth or concrete in outdoor, wet, or damp locations, coat raceway with engineer approved coal tar or epoxy based corrosion resistant coating (3M, Benjamin Moore, Carboline, or approved equal).
- 5.9 Running threads are not permitted.
- 5.10 Do not run wiring horizontally across floors or the ground, to avoid tripping hazards and facilitate cleaning floors.
- 5.11 Horizontal runs of raceway at rooftops are not permitted (to facilitate future roofing repairs/replacement) except where specifically approved in writing by the architect and owner. Horizontal runs may not exceed 2.4 m (8'0") length. Do not install any wiring or electrical equipment of any type (specifically including disconnecting means and receptacles) within 4.5 m (15'0") of any edge of any roof under any circumstance, to avoid tripping and fall hazards. Equipment and wiring is only permitted within 4.5 m (15'0") of any edge of any roof where necessary to serve utilization equipment within the space and only where specifically approved in writing by the engineer and architect (where approved suitable protective means are included to prevent fall hazards). Support raceways at roofs in a manner to avoid harming, impacting, or compromising the roofing weatherproof integrity (fully coordinate requirement with roofing contractor/supplier [where present], architect, and owner). Where wiring is installed atop roofing material, utilize only pre-cast

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concrete paving units measuring not less than 12" x 12" x 2" (300 mm x 300 mm x 51 mm) laid on the roof and bonded to the roof using suitable roofing adhesive. Running rooftop wiring on wood blocks or bricks is not permitted under any circumstance.

- 5.12 In all kitchens, food preparation, and similar areas, run wiring concealed as much as possible. Where necessary to run wiring exposed, maintain space between raceways and building surfaces and run raceways *vertically only* in such a way to facilitate cleaning walls, ceilings, and floors and to avoid accumulation of foreign materials.
- 5.13 Install wiring in such a manner to avoid infiltrating water into the wiring system (during or after construction). Install wiring in such a manner so any water which does infiltrate cannot become trapped or accumulate and cannot drain into electrical or other equipment.
- 5.14 Install exposed wiring (including visible wiring and wiring in accessible ceiling spaces or other accessible locations) parallel or perpendicular to walls, structural members, or intersections of vertical planes and floors or ceilings.
- 5.15 Install concealed wiring (except as provided above for wiring in accessible spaces) as straight and direct as possible. Detail routing of all concealed wiring on record (as-built) documents.
- 5.16 Space raceways embedded in concrete slabs, walls, beams, etc. or run underground not closer than 76 mm (3") between outsides of raceways and install to avoid changing locations of reinforcement. Except when plans of raceways are approved by the engineer, provide embedded raceways, other than those merely passing through, not larger in outside diameter than one-third the thickness of the slab, wall, beam, etc. in which embedded.
- 5.17 Embedded raceways are not permitted to cross, except where the 76 mm (3") spacing and one-third thickness provisions above are maintained or exceeded.
- 5.18 In building exterior walls and roofs, do not install any wiring, other than that merely passing through, in veneer cavity or other interstitial spaces of the building envelope.
- 5.19 Provide all splices only in suitable code-sized junction or outlet boxes. Splices are not permitted in any type of conduit body under any circumstance.
- 5.20 Do not install any wires in raceways until all raceway work is completed and closed in such a manner as to prevent the possibility of water or other foreign matter entering raceways.
- 5.21 Wherever empty or spare raceways are installed, provide suitable pull wires with identification tags securely attached to each end. Where empty or spare raceways do not terminate in boxes or enclosures, provide suitable conduit caps. Utilize only conduit fitting type caps appropriate for the conduit involved. Rubber and plastic conduit plugs, duct sealing compounds, and tape are not acceptable.

6. FASTENERS, SUPPORTS, AND HANGERS

- 6.1 Provide all fastenings, supports, hangers, clamps, and anchors of the type made for the specific purpose for which they are used.

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- A. Utilize wood screws for fastening to wood.
 - B. Utilize toggle bolts or bolt fastenings for fastening to hollow tile, terra cotta, hollow masonry units, lath, and similar construction.
 - C. Utilize machine screws/bolts with nuts for fastening to structural steel.
 - D. Utilize metallic expansion shield anchors and machine screws/bolts for fastening to concrete, brick, and solid masonry. Wooden plugs with screws and plastic expansion shield anchors are not acceptable.
 - E. Threaded studs driven in by a powder charge and provided with washers and nuts may be used in lieu of expansion anchors, machine screws, and wood screws under the applications indicated above.
 - F. Utilize engineer approved adhesive fastening on roofing areas (mechanical fasteners are not be permitted to be driven into roofing surfaces).
 - G. Threaded C-clamps are not permitted.
 - H. Additional acceptable supports for a single 21 mm (3/4") EMT only include common nails for wood, spring-tension clamps for steel and nail-type nylon anchors for masonry.
 - I. Additional acceptable supports for not more than two (2) cables (where cable wiring methods are permitted elsewhere in this specification) only include nails for wood, spring-tension clamps for steel, and nail-type nylon anchors for masonry. A single cable only may be secured directly to wood with NEC approved cable staples.
- 6.2 To prevent swaying, vibrating and/or sagging, rigidly and firmly install raceway and cable (where cable wiring methods are permitted elsewhere in this specification).
- A. Support with malleable or wrought steel clamps, hangers, or with fabricated strut type supports (steel only, aluminum is not acceptable unless specifically indicated on the drawings). Provide strut type supports as B-Line, Kindorf, Power-Strut, or Unistrut (or approved equal).
 - B. Stamped metal one-hole and two-hole straps are permitted to secure EMT and cable wiring methods permitted by the specifications in exposed and concealed dry indoor locations not subject to abuse or injury only.
 - C. Stamped metal wrap around "mineralax" type hangers are permitted to secure EMT and cable wiring methods permitted by the specifications in hidden and concealed dry indoor locations not subject to abuse or injury only. Stamped metal wrap around type hangers are not permitted for visible exposed wiring.
 - D. Additional manufactured fastening systems specifically designed for the purpose shall be considered to secure cable wiring methods permitted by the specifications, but only where submitted for review and approval before commencing work.
 - E. Do not weld raceways, clamps, hangers, or straps to steel structure.
 - F. Wire (including ceiling support wires), perforated pipe straps, plastic ties, "J" hooks, and bridle rings are not acceptable.
- 6.3 Provide all supports and fasteners of the following materials, unless indicated otherwise.
- A. Utilize stainless steel for all applications, unless indicated otherwise. Utilize stainless steel only when underground or in contact with earth or floors in outdoor areas, mechanical rooms, kitchens, and other areas subject to the possible presence of water on the floor/ground.
 - B. Steel protected by hot-dip or mechanical galvanizing after fabrication may be utilized

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- for all conditions except conditions indicated above as requiring only stainless steel. Clean areas where galvanizing is cut or damaged and touch-up with suitable zinc dust/zinc oxide paint.
- C. Steel protected by pre-galvanizing before fabrication, epoxy coating, zinc electrolytic plating, or other engineer approved corrosion resistant coating may be utilized for interior locations not subject to abuse or injury.
 - D. Other materials providing equivalent or superior strength and corrosion resistance to the above shall be considered.
 - E. Supports and fasteners without corrosion protection, protected only by painting, or protected only by oil coating are not acceptable under any circumstances.
 - F. For electrical fasteners (at conductors and all current-carrying parts), utilize only materials and types approved by the NEC and listed for the application.
- 6.4 Provide all fastening, supports, wall brackets, ceiling trapeze, and hangers for the installation of all equipment and wiring. Install all fastenings, supports and hangers in such a way and at such intervals as per NEC or otherwise required to support the equipment. The electrical contractor is responsible for verifying that supports are adequate for the load supported, based upon weight, stresses which may be applied to the support (including when installing equipment, pulling wiring, physical impacts to equipment, and seismic/earthquake loads as per IBC Section 1613), vibration, etc. Submit calculations for any supports where requested by the engineer.
- 6.5 Where the contractor installs fasteners or supports not meeting specified requirements (without prior written approval) the contractor shall remove the fasteners and supports and install new fasteners and supports as specified at no cost to the owner.

7. CHASES, RECESSES, AND OPENINGS

- 7.1 Provide, including all excavation, cutting, patching, fire stopping, sealing, backfill, surface restoration, and painting, all required openings, chases, and recesses in the construction for all work.
- 7.2 Where openings are required in new or modified structure, furnish the exact location, size, and other necessary information to the contractor installing or modifying the structure in ample time to have them incorporated during construction as approved by the architect and engineer. If the electrical contractor fails to comply with these information requirements, then the electrical contractor shall perform the necessary cutting and patching at his own expense under the direct supervision of the general contractor.
- 7.3 Where openings in masonry are required, make by coring only.
- 7.4 Locate and provide all openings (including openings for junction and outlet boxes and luminaires) in such a manner to maintain any required fire/smoke rating, waterproof, and sound transmission integrity in accordance with all applicable codes and standards (including, but not limited to IBC/BOCA, NFPA, and UL). Where boxes are located in opposite sides of fire/smoke/sound rated walls, maintain minimum spacing between boxes as per NEC. The general contractor shall provide fire/smoke rated enclosures around luminaires and boxes where required to comply with fire/smoke ratings.

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8. CUTTING, PATCHING, FIRE STOPPING, AND PAINTING

- 8.1 Perform all required excavation, cutting, patching, fire stopping, sealing, backfill, surface restoration, and painting associated with the electrical installation. Perform in accordance with general construction specifications and as indicated elsewhere in this specification. Coordinate all requirements with the general contractor. This includes cutting and patching associated with suspended ceiling tiles and grid.
- 8.2 Completely restore (including painting where applicable) all surfaces to match existing condition as directed and approved by the owner, architect, and engineer.
- 8.3 Completely seal and fire stop all penetrations of all fire and/or smoke rated walls, floors, ceilings and any other construction (including all construction required to be rated by any code) to a rating matching or exceeding the fire rating of the construction. Refer to architectural drawings and specifications for information on fire ratings of building construction and include all costs in bid. Provide the complete installation (including fire stopping methods and materials) complying with all applicable fire rating codes and standards (including the NEC, NFPA, IBC/BOCA, and UL (including the UL "Fire Resistance Directory").
- 8.4 Completely seal and weatherproof all penetrations of exterior, at or below grade, and wet location walls and floors and roof penetrations.
- 8.5 Paint all exposed raceways, boxes, enclosures, etc. as directed by the owner and architect.
- 8.6 Provide baked enamel painted finish for all equipment and materials as directed by the owner and architect. Wherever finish colors are indicated on the drawings (including symbol list and luminaire schedule) as being selected by the architect ("as per architect", etc.), include costs in bid to utilize any of the available standard and/or optional colors listed in manufacturers' catalogs (excluding any colors identified in manufacturers' catalogs as "custom" or "premium").
- 8.7 Touch up damages to prime and/or finished paint coats on equipment. This includes touching-up stainless steel surfaces to avoid superficial surface rust (i.e. at cut surfaces and welds).

9. SLEEVES

- 9.1 Provide sleeves in all construction. Provide sleeves of minimum 0.85 mm (22 ga.) galvanized steel, sized for passing raceway/cable, and of the proper design for sealing and flashing around the sleeves where required. Locate and set sleeves extending approximately 51 mm (2") above floor in concealed locations, unfinished rooms, and mechanical spaces. Locate and set all sleeves flush with finished surfaces in finished areas unless otherwise directed by the owner and architect.
- 9.2 Seal the space between the raceway/cable and sleeve and between the sleeve and structure in an engineer and code approved manner. Seal and fire-stop all penetrations to a fire rating not less than the wall, ceiling, floor, or member penetrated. Completely seal and

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waterproof all penetrations of exterior walls, roofs, mechanical room floors, or any other area subject to weather or water.

10. FLASHING AND ACCESS PANELS

- 10.1 Where a general contractor is present, base flashing is by the general contractor, otherwise base flashing is by the electrical contractor. Counter flashing (provide of 0.47 mm (28 ga.) copper) is by the electrical contractor under all circumstances.
- 10.2 Provide access panels for all items requiring accessibility for operation and maintenance or where required by code. Provide access panels of not less than 1.6 mm (16 ga.) steel frame and not less than 1.9 mm (14 ga.) steel panel, with tamper-proof fasteners, and compatible with the type of construction in which they are installed. Where installed in fire rated walls or ceilings, provide access panels with fire rating matching or exceeding the fire rating of the wall/ceiling involved.
- 10.3 Where a general contractor is present, the electrical contractor shall furnish all access panels and the general contractor shall install access panels under the direction of the electrical contractor.

11. LOCATIONS AND MOUNTING HEIGHTS

- 11.1 The approximate locations of luminaires, pipes, switches, radiation, receptacles, outlets and other equipment and materials are indicated on the drawings. Provide actual locations and mounting heights as determined by, confirmed with, and approved by the owner and architect during field construction (prior to rough-in). Where equipment or devices are installed without prior approval/confirmation or without prior written notification (see below) and the location or mounting height is not acceptable to the owner and architect, relocate the equipment and all associated wiring as directed by the owner and architect at no cost to the owner.
- 11.2 Provide mounting heights complying with all applicable federal, state, and local disabled ("handicapped") access codes, standards, and requirements, including the Americans with Disabilities Act (ADA).
- 11.3 Provide mounting heights for all equipment as follows. Utilize standard mounting heights indicated below for all equipment, unless indicated otherwise on the drawings or otherwise directed by the owner and architect. Where installation conditions and/or obstructions make it impossible to install equipment at the standard height, the mounting height may be adjusted to suit conditions, provided the mounting height falls within the listed maximum and minimum heights. Notify the architect and engineer in writing of all conditions where deviating from standard mounting heights. Provide mounting heights not greater than the maximum mounting height and not less than the minimum mounting height under any circumstance, unless specifically approved in writing by the owner, architect, and engineer.
- 11.4 All mounting heights listed below are above finished floor, unless indicated otherwise. Mounting heights listed as "to bottom" are measured to the lowest operable part of the equipment or the lowest visual indicating device on the equipment. Mounting heights

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listed as "to top" are measured to the highest operable part of the equipment or the highest visual indicating device on the equipment.

	<u>Mounting Heights</u>		
	<u>Standard</u>	<u>Minimum</u>	<u>Maximum</u>
<u>Control Devices</u>			
Wall Switches & lighting controls	46" (1.17m) to ctr. 15" (0.38m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
Thermostats & other controls	46" (1.17m) to ctr. 15" (0.38m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
<u>Receptacles and Outlets</u>			
Receptacles, tele/data, & similar *	18" (0.46m) to ctr. 15" (0.38m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
Wall mounted telephones	46" (1.17m) to top 27" (0.69m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
<u>Electrical Equipment</u>			
Safety switches **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Enclosed circuit breakers **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Devices with fuses/breakers **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Time clocks, individual **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Annunciators and displays	46" (1.17m) to ctr. 15" (0.38m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
Equip. indicated with (**) where group mounted	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Equip. indicated with (**) where too large to mount at above heights	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Branch panels	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Wall mounted distribution panels	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Controllers & grouped controls	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
<u>Fire Alarm Equipment</u>			
Fire alarm controls	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Pull stations	48" (1.22m) to top 42" (1.07m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top
Horns/speakers/strobes/bells ****	80" (2.03m) to bot. 80" (2.03m) to bot.	15" (0.38m) to bot.	96" (2.43m) to bot.
<u>All equipment mounted above counters</u>	*****	15" (0.38m) to bot.	44" (1.17m) to top
<u>Other Equipment</u>			
Other equipment mounted on standard electrical outlet boxes	46" (1.17m) to ctr. 15" (0.38m) to bot.	15" (0.38m) to bot.	48" (1.22m) to top

Contact the engineer for any equipment not listed or similar to equipment above.

- * Specifically coordinate with any wall-mounted radiation, if present
- ** Applies where equipment is mounted individually, see below for group mounted equipment.
- *** Provide metering equipment mounting heights conforming to utility company requirements, where applicable, regardless of mounting heights indicated above.
- **** For ceilings lower than 90" (2.29m), mount fire alarm signaling devices 6" (0.15m) below the ceiling. Fire alarm signaling devices may be ceiling mounted if mounted on the lowest portion of the ceiling, if mounted not higher than 9.14 m (30'0") above the lowest floor level in the room and if located and spaced in accordance with NFPA requirements.
- ***** Standard mounting height for above counter equipment is 6" (0.16m) above back splash or 8" (0.20m) above counter where no back splash is present, but not higher than the maximum shown above.

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- 11.5 Where any equipment or device protrudes more than 100 mm (4") from the finished wall surface, mount at height conforming with the ADA and in accordance with the following. Contact the engineer where maximum and minimum heights listed above conflict with mounting requirements summarized below.
- A. Mount so the bottom of equipment/device is 0.68 m (2'3") AFF or less.
 - B. Mount so the bottom of equipment/device is 2.0 m (6'8") AFF or greater.
 - C. Projecting equipment/devices are permitted mounted with the bottom between 0.68 m (2'3") and 2.0 m (6'8") AFF where protected with a suitable warning barrier in accordance with ADA requirements.
 - D. Projecting equipment/devices are permitted mounted with the bottom between 0.68 m (2'3") and 2.0 m (6'8") AFF without warning barrier protection only where specifically approved in writing by the engineer.

12. ELECTRIC SERVICE

- 12.1 Perform all electrical service work complying with applicable electric utility company standards and requirements, including metering equipment locations, equipment specifications, service/meter applications, inspections, notification, scheduling, and service pole/manhole.
- 12.2 Utility service-related work shown on the drawings is approximate as a guide to pricing only and is not fully coordinated with respective utility companies. Submit to utility companies for approval all required service/meter application forms and shop drawings on all service-related equipment and materials (service drop, lateral, and entrance conductors and raceways, metering equipment of any kind, any equipment containing a service disconnect or service overcurrent device, any equipment on the line side of a service disconnect, pole risers, transformer pads, transformer connections, any equipment subject to utility company standards/regulations, and any other equipment requested by utilities). Fully coordinate all service-related work in detail with utility companies, and obtain written approval (specifically including formal response to service/meter application) from utility companies, before releasing equipment and before associated rough-in of work. The electrical contractor is solely responsible to fully coordinate and verify service requirements with utility companies (include all costs in bid). No consideration, claims, charges, or compensation will be granted under any circumstance associated with failure to fully coordinate with or obtain full approvals from utility companies.
- 12.3 Reference single line diagram for description of the proposed electrical system.
- 12.4 Provide protective bollards for all pad mounted outdoor equipment. Provide quantity and location as per utility company standards (for both utility and customer owned equipment) unless otherwise indicated on the drawings. Provide consisting of not smaller than 102 mm (4") steel RMC filled with concrete, protruding at least 1.2 m (4'0") above finished grade, set in not less than 0.3 m (1'0") diameter x 0.9 m (3'0") deep concrete base, and in no case less than the minimum construction required by utility company standards. Provide bollards even if not shown on electrical drawings.

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13. UTILIZATION EQUIPMENT CONNECTIONS

- 13.1 Provide complete power wiring and final connections for utilization equipment as indicated on the drawings. This includes, but is not limited to, all mechanical, kitchen, manufacturing, computer, medical, office, copier, fixed, and portable equipment and apparatus. Coordinate all requirements with the contractor supplying the equipment (the supplying contractor).
- 13.2 Provide connections complete and including power wiring from the electrical contractor provided local disconnecting means to each piece of equipment. If required, pass power wiring through supplying contractor furnished control equipment (including thermostats, relays, timers, integrated controllers, starters, contactors, VFD's, etc.). Provide a single point connection or multiple-point connections (by separating one larger circuit into smaller circuits at controller and/or equipment) as applicable (include all costs in bid). The electrical contractor is responsible for taking deliveries of all control equipment (which power wiring passes through) from the supplying contractor and for mounting and passing power wiring through this control equipment. Locate control equipment as indicated on mechanical or other trades documents or as otherwise coordinated with and approved by the owner, architect, mechanical engineer, and the supplying contractor.
- 13.3 All control wiring and associated raceway is by the supplying contractor (regardless of voltage), unless specifically indicated on the drawings. All central/common control panels are by the supplying contractor (power wiring is by the electrical contractor), unless specifically indicated on the drawings.
- 13.4 Provide safety switches as local disconnecting means at all equipment. Provide switches regardless of whether shown on the drawings or not. Provide switches regardless of whether or not the equipment includes integral unit switches or circuit breakers. Provide outdoor switches as NEMA-3R and indoor switches as NEMA-1.
- 13.5 For all equipment rated 120 V or 277 V and 20 A or less, provide either direct connection, including thermal overload switch where disconnecting means is required, or suitable receptacle where equipment is supplied with cord and plug (combination of plug and receptacle serves as disconnecting means), include all costs in bid.
- 13.6 Prior to rough in of raceway or purchasing any associated electrical equipment, obtain shop drawings from the supplying contractor and verify all requirements. The electrical contractor is fully responsible for contacting and obtaining copies of approved shop drawings from the supplying contractor. This includes fully coordinating the locations of all equipment and wiring in/serving elevator shafts, pits, and machine rooms.
- 13.7 Where equipment is served by variable frequency drives (VFD's), other solid-state controllers, or other special starters or controllers, wiring indicated on the drawings is as a guide to pricing only. Prior to rough in of raceway or purchasing associated electrical equipment, verify all requirements in writing with the supplying contractor. Provide exact circuit breaker trip amperes (or fuse amperes, where applicable) for circuits feeding this equipment as coordinated with and directed and approved by the manufacturer, include all costs in bid. Where the required circuit breaker/fuse amperes exceed the ampacity of the

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specified wiring, notify the engineer in writing. Provide all safety switches connected on the load side of VFD's with auxiliary contacts and interconnect (including providing all required wiring in separate 21 mm (3/4") raceway from power wiring) with VFD controls (to prevent and stop operating VFD with load disconnected). Provide all power wiring on the load side of any VFD as a dedicated circuit (from individual VFD to motor served) with no other circuit or wiring (of any kind) in the same raceway.

- 13.8 Where heat trace, control power transformers and control power supplies (rated 500 VA and less), electric alarm bells, plug-in condensate pumps, ultraviolet germicidal lamps in HVAC equipment, electrically operated security devices, door hardware, dampers (including smoke and fire dampers), and valves (including sinks/toilets/urinals), switchgear/switchboard strip/space heaters, etc. are specified on mechanical, plumbing, fire protection, electrical, or architectural drawings or specifications, provide appropriate wiring and power connections (whether shown on electrical drawings or not). Verify and coordinate voltage and wattage/amperes in field and provide wiring accordingly. Obtain power from a suitable nearby branch circuit. Include all disconnecting means switches, junction boxes, receptacles, and other equipment as per code or manufacturer recommendations. Provide ground fault protection (utilizing protective devices complying with the NEC) for all heat tracing.
- 13.9 For ductless split ("mini") style HVAC equipment the electrical contractor shall coordinate in detail with the supplying mechanical contractor before submitting bid to ensure that the equipment is compatible with power wiring shown on the electrical drawings. The supplying contractor shall furnish only equipment which is capable of separate and independent power supply to indoor and outdoor ductless split units (powering indoor unit from outdoor unit is not acceptable, unless specifically indicated on the electrical drawings). The supplying contractor shall furnish only equipment which is arranged so the incoming power wiring is energized all of the time and so the incoming power wiring is not used to control any of the equipment involved. All control wiring between indoor and outdoor units (and branch controllers, where applicable) is by the supplying contractor (see specifications section 13.3 above). Where ductless split equipment is supplied which is normally arranged to control one unit from another by directly switching power wiring, the supplying contractor shall include any necessary suitable relays (and associated wiring and modifications) to accommodate independent power supply. The electrical contractor is responsible for ensuring that this is coordinated in advance and that the ductless split style HVAC equipment, control wiring, and relaying is furnished by the supplying contractor accordingly. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with coordination of interconnection of ductless split style HVAC equipment.

14. DEMOLITION, REMOVAL, RELOCATION, AND RE-FEEDING

- 14.1 Disconnect, remove, relocate, and/or re-feed existing wiring and electrical equipment as indicated on the drawings (including, but not limited to, as indicated in electrical notes on the drawings) and otherwise provided in contract documents. Assume that all demolition and new construction requires disconnecting, removing, relocating, and re-feeding unless verified otherwise in the field. No consideration, claims, charges, or compensation will be granted for any alleged misunderstanding of the scope of disconnecting, removing, relocating, and re-feeding or as a result of failure to verify existing conditions.

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- 14.2 Fully verify all requirements associated in any way with demolition, removals, relocations, and re-feeding and include all costs in bid. Visit site prior to submitting bid and investigate and verify all existing conditions (including verifying conditions above all accessible "drop" ceilings and in accessible chases). Completely remove from the site and properly dispose of all equipment and materials removed.
- 14.3 Prior to commencing any removals, completely verify all conditions and exact requirements related to re-feeding, maintaining, or affecting service to existing electrical equipment, devices, and wiring and mechanical, architectural, and other equipment and system in the field during construction. Where equipment or wiring is removed which is required to re-feed equipment, maintain service, or effects systems to remain, replace or reinstall the equipment and wiring. No extra consideration, claims, charges, or compensation will be granted to re-feed, reinstall, replace, reconfigure, etc. wiring and equipment where removed without first verifying all conditions.
- 14.4 Wherever electrical equipment and wiring is removed from visible finished surfaces, patch and restore the surface to the original condition matching existing adjacent surfaces. This includes all required painting, filling all openings (including channels and filling holes left from supports), etc..
- 14.5 Where existing ceilings are removed and reinstalled (either partly or entirely), remove all existing electrical equipment (including lighting fixtures, fire alarm devices [including, but not limited to, smoke and heat detectors, signaling devices, indicators, etc.], security/CCTV cameras, motion detectors, speakers, and all other electrical devices, equipment, and apparatus) from the ceiling grid and ceiling tiles. Leave in place at the ceiling and temporarily support (in a code approved and local authorities having jurisdiction approved manner) to facilitate ceiling removal. Once ceiling is reinstalled, permanently reinstall all electrical equipment in the ceiling. Where new equipment is shown on the drawings, completely disconnect and remove existing equipment (being replaced) and all associated wiring and provide all new equipment and associated wiring as shown on the drawings. Ceilings may be left open for a long period of time (i.e. there may be several months or more between the time of removal and the time of reinstalling ceilings). When ceilings are not in place, maintain (as operational) all fire alarm devices and equipment and normal and emergency lighting (temporarily install fire alarm devices, supported from structure and provide temporary lighting or temporarily support existing lighting from structure as applicable). When ceilings are not in place, safely secure everything which is exposed by the absence of ceilings (new and existing) and keep all areas clean when occupied. This ceiling work is not shown on electrical plans (see architectural drawings and ceiling plans and other trades drawings for information). This ceiling work applies regardless of the party removing the ceiling and regardless of whether or not ceiling removal is shown on drawings. Coordinate with all contractors and trades to confirm the extent of ceiling work and include all costs in bid. This ceiling work also applies where any contractor chooses to install new ceiling in lieu of reinstalling the existing ceiling.
- 14.6 Where existing ceilings are removed and new ceilings are installed (either partly or entirely), remove all existing electrical equipment (including lighting fixtures, fire alarm devices [including, but not limited to, smoke and heat detectors, signaling devices, indicators, etc.], security/CCTV cameras, motion detectors, speakers, and all other electrical devices, equipment, and apparatus) from the ceiling grid and ceiling tiles. Leave

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in place at the ceiling and temporarily support (in a code approved and local authorities having jurisdiction approved manner) to facilitate ceiling removal. Once new ceiling is installed, permanently reinstall all electrical equipment in the ceiling. Where new equipment is shown on the drawings, completely disconnect and remove existing equipment (being replaced) and all associated wiring and provide all new equipment and associated wiring as shown on the drawings. Ceilings may be left open for a long period of time (i.e. there may be several months or more between the time of removal and the time of installing new ceilings). When ceilings are not in place, maintain (as operational) all fire alarm devices and equipment and normal and emergency lighting (temporarily install fire alarm devices, supported from structure and provide temporary lighting or temporarily support new or existing lighting from structure as applicable). When ceilings are not in place, safely secure everything which is exposed by the absence of ceilings (new and existing) and keep all areas clean when occupied. This ceiling work is not shown on electrical plans (see architectural drawings and ceiling plans for information).

- 14.7 Where electrical work involves removal and reinstallation of existing ceilings, removal and relocation is the responsibility of the electrical contractor. As an alternative (at the electrical contractor's option) to reinstalling ceilings removed to facilitate electrical work, the electrical contractor may install a new ceiling of a type matching the existing ceiling provided there is no cost change to the contract (wherever new ceiling involves additional cost to the contract, new ceiling is not acceptable).

15. EXCAVATION, BACK-FILLING, AND RESTORATION

- 15.1 Perform all required excavation, cutting, patching, backfill, surface restoration, and painting associated with the electrical installation, perform in accordance with general construction specifications. Coordinate all requirements with the general contractor. Refer to the section of this specification "Cutting, Patching, Fire-Stopping, and Painting" for additional information.
- 15.2 Install all underground wiring to maintain a minimum cover of 0.8 m (2'7") to top of raceways. Where field obstructions do not facilitate the above minimum cover, minimum cover as indicated in NEC Article 300.5 is permitted. Provide foil-backed detectable plastic warning tape installed 205 mm (8") below finished grade above the top of underground wiring and underground conduit duct banks (minimum 155 mm (6") wide and with color coding and wording according to the use of the wiring; Thomas & Betts #NAF-0700 series or equivalent).
- 15.3 Perform all excavation and work in and associated with excavation in accordance with all applicable safety codes, standards, regulations, and requirements (refer to specifications section "Safety" of specifications division 16100, General Electrical).
- 15.4 Completely restore all surfaces to a condition matching or exceeding the original condition to the satisfaction of the owner, architect, and engineer. Backfilling and restoration below does not supersede or serve as a substitute for concrete encasement of raceways specified elsewhere.
- A. Earth (and other unpaved surfaces) excavation: Backfill with suitable on-site material, preferably utilizing excavated material, and compact during backfill.

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Provide additional material to provide a flush surface after compacting or settlement. Provide seeding (as directed by the owner and architect) to restore grass surfaces.

- B. Sidewalk (and other paved surfaces not subject to vehicular traffic) excavation:
Where pavement construction joints are spaced not greater than 1.8m (6'0") apart, remove complete blocks of paving to the construction joints to facilitate excavation. Where construction joint spacing exceeds 1.8 m (6'0"), either saw cut pavement at a convenient location or remove to construction joints to facilitate excavation. Backfill with suitable on-site material, preferably utilizing excavated material and compact during backfill. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement.
 - C. Roadway and parking lot (and other surfaces subject to vehicular traffic) excavation:
Saw cut pavement 76 mm (3") deep prior to excavation. Remove pavement 300 mm (1'0") beyond the edges of below grade excavation ("cut-back" pavement 300 mm (1'0") on both sides of trench). Backfill with suitable on-site material, preferably utilizing excavated material and compact during backfill. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement, filling the entire width of the excavation with "cut-backs".
 - D. Optional roadway and parking lot (and other surfaces subject to vehicular traffic) excavation: The following may be substituted for the methods indicated in item "C" above at the contractor's option. Saw cut pavement 76 mm (3") deep prior to excavation. Remove pavement to the same width as the edges of below grade excavation (without any "cut-back"). Back fill with concrete only to the bottom of the sub-base. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement.
- 15.5 Completely remove and properly dispose of any material excavated and not utilized for backfill, include all costs in bid.

END OF SECTION

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1. GENERAL PROVISIONS

- 1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications division 16100, General Electrical, are hereby made an integral part of this section.
- 1.2 The work governed by these specifications includes but is not limited to that as defined in specifications section "Scope of Work" of specifications division 16100, General Electrical.
- 1.3 Provide all materials and equipment (products) as new, the best in grade and quality, and manufactured in the United States of America with standards and ratings as specified herein. No substitution or deviation from the materials and equipment specified is permitted except by written permission from the engineer. Provide all materials and equipment as listed and/or labeled where applicable.
- 1.4 Replace or repair, to the satisfaction of the owner, any materials and equipment damaged before or after installation.
- 1.5 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc.. Where multiple manufacturers are shown in the drawings and/or specifications, not all manufacturers shown may be capable of providing materials and equipment meeting the specifications, field conditions, etc.. Manufacturers not specifically shown on the drawings or specifications shall be considered, provided the products are equivalent or superior to the requirements of the drawings and specifications (including equivalent or superior to products and/or manufacturers specifically shown on drawings and specifications). Manufacturers, whether shown on the drawings or specifications or not, are acceptable only if they can meet the specifications, conditions, and requirements specific to this project. The terms "equivalent", "equal", "equaling", and "approved equal" mean "equivalent or superior to the item/process specified when approved by the engineer", unless otherwise noted.

2. RACEWAYS

- 2.1 Steel Rigid Metal Conduit (RMC) and Steel Intermediate Metal Conduit (IMC)
 - A. Provide steel RMC as full weight, heavy wall, mild steel pipe, galvanized inside and outside.
 - B. Provide steel IMC as standard wall steel pipe; otherwise the same as steel RMC.
 - C. Provide fittings for steel RMC and steel IMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, and having full threaded hubs.
 - D. Utilize only fully threaded screw-on fittings with steel RMC and steel IMC (coat field-cut threads as per NEC Article 300.6(A)). Compression, set screw, bolt on, or other thread-less fittings are not permitted.

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2.2 Electrical Metallic Tubing (EMT)

- A. Provide EMT of high grade steel and galvanized inside and outside. Enamel coating only is not acceptable.
- B. Provide fittings for EMT of high-grade steel, having rust resistant finish, providing ample wiring space, and having smooth round edges. For EMT in damp locations (i.e. concealed), utilize only fittings of the thread-less compression type without set screws. For EMT in dry locations only, thread-less set screw steel type fittings are permitted. Die cast, set screw, and indenter fittings are not permitted.

2.3 Flexible Metal Conduit (FMC) and Liquidtight Flexible Metal Conduit (LFMC)

- A. Provide FMC ("greenfield") of high-grade steel, galvanized inside and outside, having a smooth interior, and providing a continuously effective ground. Provide fittings for FMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, of the two (2) screw type, listed and NEC approved for grounding.
- B. Provide LFMC ("sealtite") with an overall PVC sheath; otherwise the same as FMC. Provide fittings for LFMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, listed and NEC approved for grounding, and of the sealing compression gland type.
- C. Where applicable, provide FMC and LFMC manufactured to comply with NEC Article "Places of Public Assembly".

2.4 Polyvinyl Chloride Rigid Nonmetallic Conduit (PVC RNC)

- A. Provide PVC RNC of virgin PVC (or material reground from the manufacturer's own products), heavy wall, schedule 40 or schedule 80.
- B. Provide fittings for PVC RNC of schedule 40 virgin PVC, providing ample wiring space, and having smooth round edges. Make all interfaces between PVC RNC and raceways, enclosures, boxes, other conduit types, etc., utilizing adapter fittings designed for the purpose.
- C. Make all joints utilizing solvent welding method, installed to be completely watertight and pressure-tight to 172 kPa (25 p.s.i.).
- D. High density polyethylene (HDPE) conduit and type "EB" encased burial and type "A" PVC conduits are not permitted under any circumstance.

2.5 Surface Raceway

- A. Surface raceway without integral wiring devices: Provide steel type. Utilize Wiremold types #V700, #V2000, #V2100, or #V2400 (or approved equal) sized according to the number of conductors to be run in the raceway. Utilize the smallest

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size raceway facilitating conductors. Raceway smaller than #V700 type is not acceptable.

- B. Provide all steel surface raceways in factory ivory finish. Provide final painting (over the ivory factory finish) as directed by the owner and architect in the field. Provide all aluminum surface raceways in natural brushed aluminum finish.
- C. Nonmetallic surface raceways are not permitted, unless specifically indicated otherwise on the drawings.
- D. Provide all installations of surface raceways complete including all required fittings, accessories, details of installation, etc. Include costs in bid for installing surface raceways around all obstructions encountered.
- E. Provide fittings for surface raceways manufactured by the surface raceway manufacturer and specifically designed to be used with and compatible with the surface raceway and the actual installation conditions encountered. Provide fittings for surface raceways having rust resistant finish, providing ample wiring space, and having smooth round edges. Provide device box type fittings as per the section of this specification "Outlet, Switch, and Junction Boxes".
- F. Perform all cutting, bending, and offsetting of surface raceways and components utilizing tools specifically designed and manufactured for the purpose by the surface raceway manufacturer. Cutting with hacksaws and bending/offsetting with standard conduit benders is not acceptable. Where the manufacturer does not manufacture or supply tools to perform work required (as indicated in manufacturer's standard catalogs), use only tools specifically recommended and approved for the purpose by the manufacturer.
- G. Fasten and secure all surface raceways utilizing hardware concealed by the surface raceway. Visible securing and fastening hardware is not acceptable except that Wiremold #V5703 (or approved equal) supporting "back clip" type fasteners are permitted with #V700 style surface raceway without integral wiring devices only. One (1) or two (2) hole straps over the raceway are not acceptable.
- H. Specifications are based on equipment as manufactured by Wiremold. Equipment as manufactured by Hubbell and Mono-Systems (or approved equal) shall be considered.

3. OUTLET, SWITCH, PULL, AND JUNCTION BOXES

- 3.1 Provide boxes of proper types and sizes to facilitate installation and as per code at all outlets and junctions indicated on the drawings and as otherwise required.
- 3.2 In unfinished areas, mount boxes flush or exposed. In finished areas, mount boxes flush in ceilings, walls, and floors, include all required cutting and patching. Where impossible to mount flush in finished areas or where surface wiring is required to serve equipment in finished areas, finished style (Wiremold #V5730 to #V5760, equipment as manufactured by Hubbell or Thomas & Betts (or approved equal) shall be considered) surface boxes are

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permitted. Standard style pressed steel boxes are not permitted in finished areas. Where the contractor installs improper boxes in finished locations (without prior written approval), the contractor shall remove the boxes and install new boxes flush mounted (including cutting and patching to flush mount boxes and wiring and including replacing or reinstalling wiring) at no cost to the owner.

- 3.3 Utilize boxes of either unit or ganged construction and sized for devices and wiring installed and not smaller than the minimum sizes as per the drawings and specifications (and in no case smaller than the minimum size permitted by the NEC). Provide boxes as galvanized pressed steel (unless indicated otherwise), not less than 4" square, and with the proper size knockouts to facilitate wiring.
- 3.4 For flush mounted boxes, provide box shape permitting surfacing materials to be on straight lines and to fit closely around the box. Provide boxes in plastered, drywall (GWB), and similar walls, partitions, and ceilings with suitable plastering rings.
- 3.5 Utilize cast and/or malleable rust-resisting steel boxes for wiring in exterior, wet, or damp locations and for exposed visible steel RMC and IMC runs. Utilize aluminum or alloy boxes only where aluminum conduit is permitted by the specifications and used.
- 3.6 For all boxes in floors, utilize only boxes specifically designed, NEC approved, and listed for floor installation (including maintaining fire rating of the floor).
- 3.7 Provide all boxes for lighting outlets with studs of a size suitable for the weight of the luminaire supported (in no case less than 10 mm (3/8")). Provide the stud of integral construction with the box or of the type inserted from the back of the box. Studs held to the box with bolts to support luminaire weight are not permitted.
- 3.8 100 mm (4") diameter "octagon" boxes are not acceptable, except under the following conditions. Octagon boxes are permitted in conjunction with luminaire mounting studs where studs are required above. Octagon boxes are permitted where required to mount equipment where equipment is not compatible with square or ganged type boxes (including the use of adapter rings on square boxes).
- 3.9 Secure boxes firmly in place and set true, square, and flat or flush (as applicable) with finished surfaces. Keep all unused knockouts closed or close with suitable threaded plugs (for threaded knockouts or hubs) or knockout seals (for unthreaded knockouts). Install flush mounted boxes so the covers are flush with the finished surface.
- 3.10 Provide all boxes with cover plates as specified below.

4. COVER PLATES

- 4.1 Provide cover plates for switches, receptacles, outlet and junction boxes, and other devices of 1.0 mm (0.04") thick metal with paint finish or of stainless steel (as directed by the owner and architect, include costs in bid for painted or non-magnetic stainless steel), unless indicated otherwise.
- 4.2 Utilize suitable pressed galvanized steel code gauge raised covers for exposed wiring methods in unfinished areas and accessible hidden locations. Flat pressed galvanized steel

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code gauge covers may be utilized on junction boxes (where devices are not installed) or for ganged devices (three (3) gang or greater only). Tile and/or plastering rings style covers are not permitted for exposed wiring methods under any circumstance.

- 4.3 Utilize cast rust-resisting steel or #302 stainless steel covers with gaskets for boxes in wet, damp, or exterior locations or other locations where cast steel boxes are utilized.
 - 4.4 Provide suitable blank covers on all unused boxes and boxes for future use (including boxes where devices are not installed at the time that electrical work is completed; specifically including telephone/data outlets where jacks and covers are not installed).
5. CONDUCTORS AND CABLE (600 V)
- 5.1 Provide all wiring (for all systems) utilizing multiple single conductors in raceway, unless indicated otherwise. Conductor sizes indicated in the specifications and on the drawings are the minimum that will be accepted (conductor sizes are identified based on the NEC, as either American Wire Gauge [AWG] or thousands of circular mils [MCM or kcmil]). Where the contractor installs conductors smaller than the minimum size, the contractor shall remove conductors and install new conductors of the specified size at no cost to the owner.
 - 5.2 Provide all conductors (including conductors in cables, where permitted) as 600 V, having flame retardant, heat resistant, and moisture resistant insulation, and listed and marked in accordance with industry standards and the NEC. Unless indicated otherwise, provide all conductors identified both as type "THHN" and as type "THWN" ("THHN/THWN"), rated 90 degrees C for dry and damp locations and rated 75 degrees C for wet locations. Conductors identified as type "XHHW" (in lieu of type "THHN/THWN") are permitted only where conductors are of the compact stranded type (type "XHHW" is not permitted for solid conductors or for standard concentric or compressed stranded conductors). Provide all conductors for all systems of a type suitable for installing in dry, damp and wet locations. Conductors suitable for dry locations only and conductors suitable for dry and damp locations only are not acceptable (except as specifically otherwise provided for plenum rated systems cables).
 - 5.3 Provide all conductors of soft drawn copper (Cu, CU) wire of 98% conductivity. Aluminum (Al, AL) conductors are not acceptable, unless specifically indicated otherwise on the drawings.
 - 5.4 Where permitted elsewhere in this specification, provide metal clad cable (type "MC") having interlocked steel or aluminum cladding and having conductors as specified above, including an insulated grounding conductor. Provide conductors #10 AWG and smaller as solid and conductors #6 A.W.G and larger as stranded. Conductors #8 AWG may be solid or stranded. Provide type "MC" cable listed and NEC approved to provide an acceptable grounding path. Provide fittings for type "MC" cable of suitable pressure pad/clamp type, high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, and having full threaded hubs. Fittings utilizing set screws are not acceptable. "Snap-in" fittings of any kind (including, but not limited to, fittings designed to fasten in knockouts or hold cable with spring tension, fittings without treaded hubs, and fittings designed to be installed without the use of tools) are not acceptable. Provide type "MC"

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cable as listed and install in complete accordance with NEC Article 330. Where permitted by the NEC (including Article 604), listed manufactured wiring systems consisting of cables identified as type "MC" may be utilized wherever specifications allow the use of type "MC" cables. Where permitted by the NEC (including Articles 725 and 770), listed type "MC" cables containing Class 2 and Class 3 cable and/or optical fiber members in addition to power conductors may be utilized wherever specifications allow the use of type "MC" cables.

6. SPLICES, TAPS, AND CONNECTIONS

- 6.1 Make all splices, taps, and connections at locations indoor and above ground only. Splices, taps, and connections are not permitted below grade (including below any floor level where the floor is in direct contact with earth, i.e. basement slabs, slabs on grade, etc.), or where subject to being submerged (except as specifically provided as follows). Route raceways and wiring accordingly and include all costs in bid. Where physically impossible to install wiring to make splices/taps above grade, splices/taps below grade shall be considered where specifically requested in writing in advance (prior to installing conductors) by the contractor and where approved in writing by the engineer. Specifically and individually identify each and every case involved for below grade splices/taps in the request(s) and submit shop drawings for splices/taps (as indicated below). Where below grade splices/taps are installed by the contractor (without prior written approval) the contractor shall remove the raceways, wiring, splices, and taps and install new raceways and wiring in such a manner to completely avoid below grade splices/taps at no cost to the owner.
- 6.2 Perform all splices/taps in suitable code sized outlet and junction boxes only, not in raceways, conduit bodies, or equipment cabinets. Clean each strand of conductors carefully before connecting.
- 6.3 Insulation piercing type splices, taps, and connections of any kind are not permitted under any circumstance (including where applied after removing insulation).
- 6.4 Provide connections at equipment, apparatus, and devices for a complete installation and as follows. Coordinate all requirements with equipment to connect.
 - A. Where equipment includes factory "pig tails" for connections, make connections as specified above for splices and taps.
 - B. For stranded wiring #10 AWG and smaller, utilize suitable crimp-on "stacon" type terminals. Where equipment terminals include pressure pads, wiring may terminate directly at equipment without crimp-on terminals. Connecting stranded wiring directly at wire binding screw terminals (i.e. wrapped around screw) is not permitted under any circumstance.
 - C. For solid wiring #8 AWG and smaller, provide wiring connecting directly at terminals.
 - D. For wiring #6 AWG and larger and #8 AWG stranded wiring, utilize suitable crimp-on compression lugs. Where equipment is provided with factory-installed lugs, wiring may connect directly at factory lugs.

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- 6.5 Provide splices and taps at indoor locations and outdoor locations above ground (excluding exposed outdoor splices/taps) as follows.
- A. For stranded wiring #10 AWG and smaller and solid wiring #8 AWG and smaller, make splices/taps by twisting conductors together and utilizing suitable pressure type "wire nut" connectors. Tightly over-wrap with vinyl insulating tape. Utilize listed wire nuts with internal coiled square metal binding spring ("all plastic" and porcelain wire nuts are not acceptable under any circumstance). For splices/taps in wet locations, utilize only "self-sealing" wire nuts with integral water repellent non-hardening sealant (Ideal #60 "DB Plus" or approved equal).
 - B. For wiring #6 AWG and larger and for #8 AWG stranded wiring, make splices/taps utilizing suitable crimp-on compression connectors. Bolted type connectors are not permitted, except where available crimp-on compression connector configurations do not correspond to combinations and arrangement of conductors to be connected. Wrap with rubber insulating tape or vinyl mastic of type, thickness, and insulation level equaling or exceeding the original insulation then tightly over wrap the entire assembly with vinyl insulating tape covering all rubber tape/mastic without gaps or voids.
- 6.6 Provide all splices and taps underground, below grade, and subject to being submerged (where specifically approved in writing by the engineer) as follows. Provide splices/taps of direct buried and open aerial wiring (where specified elsewhere) as follows. Submit shop drawings for all proposed splice/tap products and methods. Where any splice/tap is installed in any underground, below grade, submerged, or exposed wet or outdoor location for which shop drawings are not previously submitted, the contractor shall disconnect and remove the installed splices/taps and provide new acceptable splices/taps (as directed by the engineer) at no cost to the owner.
- A. Utilize manufactured or pre-engineered splices/taps specifically designed and listed for the application, including being suitable for installation underground, direct buried, submerged, and in wet locations. Provide outdoor exposed splices/taps also as sunlight resistant. Pre-molded, heat-shrink, and cold-shrink manufactured kits and engineer approved pre-engineered hand-wrapped tape kits shall be considered.
 - B. For underground splices/taps of stranded wiring #10 AWG and smaller and solid wiring #8 AWG and smaller only, splices/taps may be made as follows. Permanently electrically connect conductors by either of the following options:
 - 1) Twist conductors together then solder conductors. Utilize suitable pressure type wire nut connectors with integral water repellent non-hardening sealant (Ideal #60 "DB Plus" or approved equal) to mechanically bind the soldered splice/tap and tightly over wrap with vinyl insulating tape.
 - 2) Splice/tap conductors with suitable insulated crimp-on connectors and tightly over wrap with vinyl insulating tape.

Once electrically connected, embed splices/taps in sealant compound. Utilize only engineer approved hardening flexible sealant (i.e. "bondo" traffic detector loop style

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sealant; contact the engineer for information and submit shop drawings for approval). Place sealant (uncured liquid) in a suitable container, immerse splices/taps in sealant in the container, and rigidly support splices, taps, and conductors in place until sealant has set.

- C. Self-sealing wire nuts (used alone and/or when over wrapped with vinyl insulating tape) are not an acceptable substitute for splices/taps as specified in items "A" and "B" above.
- 6.7 Splices, taps, and connections (and associated materials) as manufactured by Burndy, Elastimold, G&W, Homac, Ideal, IlSCO, Mac Products, O-Z/Gedney, Plymouth, Raychem, Scotch/3M, and Thomas and Betts/Blackburn (or approved equal) shall be considered.

7. GROUNDING MATERIALS

- 7.1 Provide all material used for grounding of non-ferrous copper. Aluminum is not acceptable, unless specifically indicated on the drawings.
- 7.2 Provide all driven (made) grounding rod electrodes of copper or copper clad steel, minimum 19 mm (3/4") diameter by 3.0 m (10'0") long.
- 7.3 Provide all grounding conductors in accordance with the section of this specification "Conductors and Cable (600 V)", except as follows. Grounding conductors may be insulated or bare, except as follows. Wherever grounding conductors #6 AWG and smaller are insulated, provide insulation colored green. Provide "isolated" grounding conductors as insulated only (green with yellow tracer). Provide grounding conductors run in raceway/cable with wiring as insulated only (bare conductors are not permitted for grounding conductors run with wiring, except cable wiring methods permitted elsewhere in the specifications where insulated grounding conductors are not available).
- 7.4 Provide all grounding connections as per the section of this specification "Splices and Taps", except as modified below. Grounding connections do not require insulation.
- 7.5 For wiring #4 AWG and larger, provide all grounding connections utilizing exothermic weld process (Erico/Cadweld, Thermoweld, Thomas & Betts, or approved equal). Crimp-on compression type connectors may be used only where available exothermic weld process connection configurations do not correspond to combinations and arrangement of conductors to be connected. Bolted type connectors are not permitted, except where available exothermic weld process and crimp-on compression connector configurations do not correspond to combinations and arrangement of conductors to be connected. Where equipment is provided with factory installed lugs, #4 AWG and larger wiring may terminate directly at factory lugs.
- 7.6 Utilize only exothermic weld process connections for all concealed grounding connections (compression, mechanical, and other grounding connections are not permitted concealed). Where available exothermic weld process connection configurations do not correspond to combinations and arrangement of conductors to be connected in concealed locations, utilize combinations and arrangement of conductors necessary to facilitate exothermic weld process connections and extend from the concealed connection location to an accessible

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location where crimp-on compression or bolted type connections may be utilized (as permitted above).

- 7.7 Accessible connections of wiring #6 AWG and smaller to piping and similar materials/equipment may utilize multiple-bolt type ground clamps. Accessible connections of wiring #6 AWG and smaller to driven (made) grounding rod electrodes may utilize one-piece, single bolt "acorn" type ground clamps.
- 7.8 Provide conduit grounding bushings of galvanized malleable iron with integral screw pressure connector or provisions to accept factory or field installed lug where required.

8. IDENTIFICATION, NAMEPLATES, AND TAGS

- 8.1 Provide all new electrical equipment with engraved three (3) layer laminated plastic nameplates describing the equipment, load/device served, ratings, circuit(s) feeding the equipment, etc. as indicated below. Provide engraved plastic nameplates for existing electrical equipment where modified or connected to as part of this project or where specifically indicated on the drawings. Provide these engraved plastic nameplates in addition to any code required or manufacturers' standard nameplates.
- 8.2 Provide engraved plastic nameplates for all electrical equipment, including, but not limited to, safety switches, enclosed circuit breakers, branch panels, distribution panels (including branch circuit breakers and circuit breaker spaces), any equipment containing fuses, power outlets, thermal overload switches, time clocks, photocells, fire alarm equipment and devices, motor controls (starters, variable frequency drive [VFD] units, etc.) where furnished by the electrical contractor, etc. (where applicable). Provide engraved plastic nameplates for all receptacles and switches where dedicated to serving specific equipment. Provide engraved plastic nameplates for convenience receptacles (only where indicated on the drawings).
- 8.3 Secure engraved plastic nameplates with suitable screws or rivets, self-adhesive nameplates are not acceptable. Provide engraved plastic nameplates with white letters on black background, unless indicated otherwise. Provide engraved plastic nameplates with 6.5 mm (1/4") minimum lettering, unless indicated otherwise. Provide engraved plastic nameplates on the front and/or cover of the equipment plainly visible when the cover (where applicable) is closed, unless indicated otherwise.
- 8.4 Submit shop drawings showing proposed sizes (overall and lettering sizes) and exact proposed wording (including exact arrangement of wording) of all engraved plastic nameplates for review and approval.
- 8.5 Provide all engraved plastic nameplates in accordance with the following example. Equipment names are the alphanumeric designation for equipment indicated on the drawings (i.e. "MDP", "PP1", "EF-1", etc.). Equipment descriptions identify the equipment in "plain English" (see example). Indicate the operating voltage of the equipment, including phase and wires (see example). Where equipment includes overcurrent devices (i.e. main breaker panels, fused switches, enclosed circuit breakers, etc.) show the appropriate amperes on the engraved plastic nameplate. Where equipment does not include overcurrent devices (i.e. main lug panels, unfused switches, contactors, transformers, etc.) show the amperes of the overcurrent device protecting the circuit serving the equipment.

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Remarks include information as described below.

EXAMPLE ENGRAVED PLASTIC NAMEPLATE WORDING

Equipment Name (use 10 mm (3/8") lettering):	PP1
Equipment Description:	POWER PANEL
Equipment Voltage, Phase, Amperes:	120/208V-3PH-4W, 100A
Remarks:	FED FROM MDP - CCT. 4

- A. Branch Panel: Provide engraved plastic nameplate showing panel name and use (description) as indicated on the single line diagram and/or respective panel schedule. Remarks indicate the panel and circuit number or transformer feeding the panel.
- B. Distribution Panel: Provide "master" engraved plastic nameplate on the front cover showing information as indicated above for branch panels. For multiple section panels, locate master nameplate on the section containing the main breaker or incoming line main lugs. Remarks indicate the panel and circuit number or transformer feeding the panel (i.e. sub-distribution panel) or indicate "Service Disconnect" if a service entrance distribution panel. Provide additional nameplates for all branch circuit breakers and circuit breaker spaces (see below).
- C. Branch Circuit Breaker in Distribution Panel: Provide engraved plastic nameplate for each new circuit breaker within a distribution panel (including breakers in existing panels connected to as part of this project). Show the name and description of equipment/load fed. Voltage and phase are not required on these nameplates. Amperes are not required on these nameplates if the rating is clearly and visibly indicated on the circuit breaker. Where adjustable trip circuit breakers are used, show the proper ampere setting on this nameplate. Remarks indicate the approximate location of the equipment/panel served. Where the distribution panel includes a hinged overall cover door, provide these nameplates mounted inside the hinged door.
- D. Circuit Breaker Space in Distribution Panel: Provide engraved plastic nameplate for each circuit breaker space within a new distribution panel. Show the word "SPACE" and the maximum circuit breaker poles and frame size ampere rating. Equipment name, description, voltage, and remarks are not required on these nameplates. Where the distribution panel includes a hinged overall cover door, provide these nameplates mounted inside the hinged door.
- E. Safety Switch/Enclosed Circuit Breaker: Provide engraved plastic nameplate with the name and description of equipment/load fed. Remarks indicate the panel and circuit number or transformer feeding the switch/breaker. Ampere rating may be omitted if the proper rating is clearly indicated on the switch/breaker and is visible with the cover closed. Where fusible switches are used, show the fuse ampere rating. Where adjustable trip circuit breakers are used, show the proper ampere setting.
- F. Fusible Device: On the inside cover of each fused device, provide an engraved plastic sign indicating the proper fuse size (as indicated on the drawings or otherwise required). Provide nameplate reading, "USE ___A FUSE ONLY" (fill in the proper fuse rating).

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8.6 Provide engraved plastic nameplates for power outlets, thermal overload switches, and for receptacles and switches where dedicated to serving specific equipment. Show the equipment served, the voltage and ampere rating, and the circuit feeding the equipment. Utilize 3.2 mm (1/8") high minimum lettering. Provide as per the following example:

Equipment Name and Description: MO-1 MICROWAVE OVEN
Equipment Voltage and Amperes: 120V, 20A - PP1-12

8.7 Where specifically indicated on the drawings only, provide engraved plastic nameplates for convenience receptacles showing the voltage and ampere rating and the circuit feeding the receptacle. Utilize 3.2 mm (1/8") high minimum lettering. Provide as per the following example:

Equipment Voltage and Amperes: 120V, 20A
Equipment Circuit: PP1-14

8.8 Provide engineer approved wrap-around adhesive or tube type wire tags or markers for all conductors, except conductors in feeders tagged as indicated below. Provide tags/markers indicating the panel or device where the wiring originates and the conductor circuit number (or other identifying number/letter/designation unique to the conductor). Tag/mark neutral and grounding conductors with the respective circuit number(s) of the corresponding phase conductor(s).

8.9 Provide engineer approved tags for all panel feeders (regardless of ampere rating) and other circuits (600 V and less) rated 100 A and larger, at both ends and at all intermediate junction and pull boxes. Provide tags indicating the circuit designation or equipment served, panel name and circuit number (or other source of feeder), and stating the voltage, phase, and amperes of the circuit. Provide tag wording and layout similar to engraved plastic nameplates as indicated above.

8.10 Where any conductor size differs from the conductor size normally expected for the respective overcurrent device (for any reason, whether specified or not, including voltage drop, NEC "tap rule" application, ampacity de-rating, etc.), provide engineer approved tags at the point where the wiring terminates at the overcurrent device reading, "WIRING IS ADJUSTED FOR VOLTAGE DROP/TAP RULE/DE-RATING, USE MAXIMUM ___A FUSE/CB" (indicate the proper reason for the adjustment and fill in the proper overcurrent device ampere rating). For feeders, this information may be included on the tags specified above.

8.11 Provide all new and existing branch panels (where connected to or modified as part of this project) with accurate and descriptive typewritten circuit directories. For existing panels, provide directories including all modifications as part of this project as well as all previous "penciled in" changes and information. Actual tracing and identifying of existing circuits is not required, unless specifically indicated on the drawings. Submit photocopies of circuit directories as part of as-built record documents.

8.12 Provide all new electrical equipment with all caution, danger, and warning signs or indications required by any applicable regulation, code, standard, or manufacturer's

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recommendation (provide as listed where applicable and refer to specifications section "Regulations and Codes" of specifications division 16100, General Electrical). This includes, but is not limited to NEC Articles 100, 110, 200, 230, 250, 450, 490, 504, 513, 516, 550-552, 585, 620, 647, 665, 669, 690, 692, 700, 705, etc., as applicable.

- 8.13 Identify conductors in complete accordance with the NEC and as indicated below. For conductors #6 and smaller, identify by natural insulation color. For conductors #4 and larger (and for cable wiring methods where applicable colors are not readily available from cable manufacturers), identify by natural insulation color or by a 155 mm (6") long (minimum) band of colored vinyl electrical tape on conductors at all terminations and in all boxes and enclosures. Where "tracers" are required, identify by natural insulation color including narrow stripes of the tracer color. Where conductors including tracer stripes are not readily available, provide a 25 mm (1") band of tape (apply over and in the center of the 55 mm (6") band of tape, where applicable) of the tracer color at all terminations and in all boxes and enclosures.
- 8.14 Identify phases of all conductors where more than one phase conductor is present (in raceways, cables, boxes, enclosures, etc.) with methods as indicated above. Utilize standard color-coding throughout the project as follows:

120/208 V SYSTEM	
A-phase	Black
B-phase	Red
C-phase	Blue
Neutral	White
Ground	Green

9. LOCKS AND KEYS

- 9.1 Provide all locks for lighting and power panels, fire alarm and signaling cabinets and all other electrical systems or locked apparatus with keys which are alike.

10. RECEPTACLES AND SWITCHES

- 10.1 Provide all receptacles and switches as industrial and specification grade, totally enclosed in non-flammable and heat resistant heavy-duty thermoset or thermoplastic case, with terminal screws on the side of the case. Pigtail conductor connections are not permitted (except for specialty devices where side terminal screws are not available options in the manufacturer's catalog), unless specifically indicated otherwise. Provide color as selected and approved by the owner and architect.
- 10.2 Provide receptacles as duplex, parallel blade, side wired, three (3) wire, grounding type, 20 A, 120 V, and listed as "tamper-resistant", unless specifically indicated otherwise on the drawings. Listed combination receptacle and separable snap-in wiring terminal assemblies (Hubbell "SNAPConnect" style, Pass & Seymour "PlugTail" style, or approved equal) may be used and may utilize pigtail connections on the wiring terminal assemblies.
- 10.3 Provide weatherproof receptacles listed as weather-resistant type and mounted in a weatherproof box with gasket and single spring-hinged weatherproof-while-in-use cover over both receptacle positions.

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- 10.4 Provide receptacles at accessory buildings (at or below grade), bathrooms (including rooms containing bathtubs or showers), crawl spaces, dishwashers, garages, janitor closets, kitchens, kitchenette counters, laundry areas, outdoors, rooftops, unfinished basements, wet locations, within 6'0" of any sink, and as indicated on the drawings or required by the NEC with integral ground fault circuit interrupter (GFCI) protection for personnel with trip characteristics as per the NEC and UL standards. Utilize only weather-resistant type receptacle mounted in a weatherproof outlet box with single spring-latched weatherproof-while-in-use cover for boat hoists and in all outdoor, rooftop, and wet locations. Feed-through protection of standard type receptacles from other GFCI receptacles is not acceptable (unless specifically indicated otherwise on the drawings). Protection of standard type receptacles in readily accessible locations from GFCI circuit breakers is not acceptable (see below for inaccessible receptacles). For inaccessible receptacles (locations which are not readily accessible as per the NEC, for example where located behind equipment, appliances, or obstacles) the use of GFCI type receptacles is prohibited and protection of standard type receptacles from GFCI circuit breaker must be used (identify receptacles as protected as per the NEC). Provide compliant GFCI protection wherever required by the NEC whether indicated on the drawings or not.
- 10.5 Provide wall switches as single pole, three-way, or four-way as applicable, heavy duty flux tumbler type, UL "T" rated, specification grade, and rated 20 A, 277 V and 120 V.
- 10.6 Provide horsepower rated single-pole thermal overload switches (manual motor starters, O/L switches, etc.) with thermal overload heater element coordinated with equipment served. Where overload protection is not required (where the switch acts only as disconnecting means) provide overload heater element rated in excess of the branch circuit breaker amperes.
- 10.7 For all switches where locking provisions are required by Code or indicated on the drawings and for all thermal overload switches, provide a suitable handle locking guard capable of visibly padlocking in the open or closed position (with switch handle position visible when locked).
- 10.8 For all receptacles at any location in hospitals and in patient care and/or treatment areas in other occupancies (doctors/nurses offices, athletic training, first aid rooms, etc.) provide receptacles as hospital grade (in addition to requirements above) and provide wiring feeding the receptacles complying with NEC Article 517.13

11. SAFETY SWITCHES

- 11.1 Provide all safety switches (disconnect switches) of the quick-make and quick-break type, with contacts not marked or shielded, designed to function if the operating spring fails or is removed, with mechanical interlock so operation is impossible when the cover is open (provide means to manually bypass/defeat the interlock), with provisions for padlocking in both the open and closed positions, and of the heavy duty type. Provide switches with voltage ratings equaling or exceeding the operating voltage. Provide indoor switches with NEMA-1 enclosures. Provide outdoor switches with NEMA-3R enclosures. Where NEMA-4X enclosures are specifically indicated on the drawings only, provide of the stainless steel type only.

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- 11.2 Provide fuse clips in fusible switches to facilitate fuses as per the section of this specification "Fuses". Provide suitable "rejection" type clips to prevent replacing fuses with short circuit ratings lower than specified.
- 11.3 Provide safety switches with ground busses. Where neutral conductor is present, provide safety switches with separate neutral busses (with provisions for bonding, bond where required by the NEC).
- 11.4 For all safety switches on the load side of variable frequency drive (VFD) units, provide safety switches with integral "electrical interlock" auxiliary contacts (one (1) N.O. and one (1) N.C., minimum) which "break" before safety switch opens. Provide two (2) #14 AWG interlock conductors run (in raceway with line side power conductors) from auxiliary contact to VFD unit. The VFD supplying contractor shall connect interlock wiring at VFD unit to shut down VFD unit if safety switch is opened to prevent operating VFD without load connected.
- 11.5 Equipment as manufactured by ABB/GE, Eaton, Schneider, and Siemens (or equivalent) shall be considered.

12. FUSES

- 12.1 Provide an NEC cartridge fuse for each fuse-gap in the work. Furnish three (3) spare fuses of the rating installed to the owner for each fused device. Specifications are based on equipment as manufactured by Eaton/Bussman. Equipment as manufactured by Mersen and Littlefuse (or approved equal) shall be considered.
- 12.2 Provide fuses of the dual element time delay, current limiting, and non-renewable type with voltage rating not less than the operating voltage and coordinated with the respective fuse clips and with short circuit rating of 200,000 A. Provide fuses as class "RK1" (600 A and less, Eaton/Bussman #LPN/S-RK series) or class "L" (over 600 A, Eaton/Bussman #KRP-C series). Class "CC" fast acting (Eaton/Bussman #LP-CC series) or time delay (Eaton/Bussman #KTK-R series) fuses, as recommended by manufacturer, are permitted for control applications.

13. CIRCUIT BREAKERS

- 13.1 This section applies to all circuit breakers installed within or in conjunction with branch and distribution panels, enclosed circuit breakers, contactors, starters, and any other electrical equipment, unless indicated otherwise.
- 13.2 Provide all circuit breakers of the molded case type unless specifically indicated otherwise. Provide readily removable from the front of panels and equipment without disturbing adjacent units, having quick-make and quick-break toggle mechanisms and non-fusible contacts, having inverse time and short circuit characteristics, which trip free on overload or short circuit so that they cannot be held closed on overload, clearly indicating whether they are in the open, tripped, or closed position. Provide automatic release obtained through the medium of a bimetallic thermal type element (ambient compensated) engaged in the releasing latch of the breaker or mechanism.

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- 13.3 Provide circuit breakers in branch and distribution panels with short circuit ratings as indicated in the respective equipment specifications. Provide circuit breakers as part of enclosed circuit breakers, contactors, starters, and any other electrical equipment with short circuit ratings not less than the short circuit rating of the first overcurrent device on the line side of the breaker, unless indicated otherwise on the drawings.
- 13.4 Provide field-installed handle locking devices for all circuit breakers not requiring switch control, for all circuit breakers feeding emergency lighting equipment (including battery equipment) and fire alarm controls, and for all circuit breakers fed from an emergency generator system (where applicable).
- 13.5 Provide 15 A and 20 A circuit breakers "SWD" and "HID" rated. Provide branch panel (250 V and less) circuit breakers rated 70 A and less as "HACR" rated. Provide enclosed circuit breakers and circuit breakers in distribution panels rated 250 A and less as "HACR" rated.
- 13.6 Provide all circuit breakers over 250 A of a type with interchangeable trip units. Provide all circuit breakers rated 1,000 A or larger and operating at over 250 V with integral ground fault protection for equipment. Unless alternative means for arc energy reduction are specifically indicated otherwise on the drawings or specifications, provide all circuit breakers rated 1,200 A or larger with an individual energy-reducing maintenance switch with local status indicator.
- 13.7 Short Circuit, Coordination, and Arc Flash Report: Where circuit breakers include or facilitate adjustable settings, adjust and set as follows (short circuit, coordination, and arc flash report is NOT required if all new circuit breakers are fixed with no adjustable settings). Set adjustable continuous current settings (where applicable) to ratings shown on drawings. For adjustable instantaneous, short time, and ground fault settings (where applicable), the electrical contractor is responsible for (include all costs) a short circuit, coordination, and arc flash study performed by the respective circuit breaker manufacturer. Set breakers and label all associated electrical equipment as per this study. Provide study in accordance with applicable ANSI and IEEE standards. Gather all information required by the manufacturer to perform this study. Submit a written report of the study to the engineer for review prior to releasing equipment for manufacture. The coordination study may be limited to a minimum of coordinating each adjustable setting circuit breaker with the nearest line side overcurrent device directly feeding the breaker and all nearest load side overcurrent device(s) fed directly by the breaker. The short circuit study and arc flash study is required for all electrical equipment containing new circuit breakers which include or facilitate adjustable settings, for all equipment fed from ("downstream of") new circuit breakers which include or facilitate adjustable settings, for all equipment which feeds ("upstream of") new circuit breakers which include or facilitate adjustable settings back to all utility and/or generator source(s) (except that other unrelated equipment which branches off of "upstream" equipment is not required to be included in the study, unless specifically indicated otherwise), and as otherwise required to complete the coordination study and confirm proper settings. Setting adjustable circuit breaker settings to the minimum or factory "default" settings (i.e. as shipped from the factory) is not acceptable. Where the short circuit, coordination, and arc flash report is not submitted by the contractor or where devices are not set accordingly (for example, including where devices are set to the minimum or factory default settings) the electrical contractor may be held liable for nuisance tripping which may occur.

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14. ENCLOSED CIRCUIT BREAKERS

- 14.1 Provide each enclosed circuit breakers consisting of a molded case circuit breaker, with a trip rating as indicated on the drawings, with provisions for padlocking in both the open and closed positions, within a listed enclosure manufactured for the purpose of housing a circuit breaker. Provide indoor breakers with NEMA-1 enclosures. Provide outdoor breakers with NEMA-3R enclosures.
- 14.2 Provide circuit breakers (including short circuit ratings) as specified elsewhere in this specification. Provide circuit breakers of the bolt-on type.
- 14.3 Provide enclosed circuit breakers with ground busses. Where neutral conductor is present, provide safety switches with separate neutral busses. Provide neutral bus with provisions for bonding and bond where required by the NEC.
- 14.4 Equipment as manufactured by ABB/GE, Eaton, Schneider, and Siemens (or equivalent) shall be considered.

15. BRANCH PANELS

- 15.1 Provide branch panels (panel boards) of dead front completely enclosed safety type construction, listed (with all components bearing labels), of a type suitable for use as service entrance, and containing thermal-magnetic "bolt-on" type circuit breaker branches as per the respective schedules on the drawings.
- 15.2 Provide circuit breakers as specified elsewhere in this specification.
- 15.3 Provide cabinets consisting of code gauge galvanized sheet steel boxes of sufficient depth, width, and length to mount the panels as indicated on the drawings and to facilitate wiring, with suitable lugs for mounting panel interiors, and with wiring gutters at top, bottom, and sides of sufficient size to adequately accommodate the raceways, conductors, and cables entering and leaving (provide all gutters at least 100 mm (4")).
- 15.4 Provide panel faces with adjustable indicating type clamps and of door-in-door construction, with inner door opening over the circuit breaker section and outer door over wiring space (both secured with locks and pulls as per specifications section "Locks and Keys"), hung with heavy hinges, and with faces and doors not less than 2.7 mm (12 ga.) thick.
- 15.5 Provide metal frame circuit directory holders welded to the inside of the cabinet doors with transparent covers. Place typewritten directories in these holders.
- 15.6 Provide bus bars with ampacity as indicated on the drawings (or corresponding to main breaker, where applicable) and with all current carrying parts sized per UL 67 heat rise testing.
- 15.7 Provide panels with copper or aluminum bus bars.

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- 15.8 Provide panels with separate ground and neutral busses. Provide neutral bus with provisions for bonding and bond where required by the NEC.
- 15.9 Provide panels with 10,000 A short circuit rating (A.I.C., I_{sc}), unless indicated otherwise on the drawings. Provide panels fully short circuit rated, series short circuit rating of panels are not acceptable (unless specifically indicated otherwise).
- 15.10 Equipment as manufactured by ABB/GE, Eaton, Schneider, and Siemens (or equivalent) shall be considered.
- 15.11 Where indicated on the drawings or required by code, provide with integral factory installed transient voltage surge suppression (TVSS). Provide for all emergency panels whether shown on not on drawings.
- 15.12 Where branch wiring fed from the panel utilizes cable wiring methods (i.e. types "AC" or "MC" cables, where permitted elsewhere by the specifications) avoid visible exposed cables in electrical closets and electrical rooms by either of the following options:
 - A. Provide suitable sheet metal panel "skirt" enclosure(s) above and/or below the panel to completely enclose cable wiring methods so not more than a 300 mm (12") total length of each cable is visible. Provide skirt enclosures fabricated of galvanized sheet steel not less than 0.55 mm (26 ga.) thick.
 - B. Provide a nearby junction box for branch wiring as indicated below.
- 15.13 Where panels are flush mounted, provide an adjacent junction box for branch wiring as indicated below.

16. JUNCTION BOXES FOR BRANCH PANELS

- 16.1 Provide suitable junction boxes (and/or wiring troughs) for branch wiring at branch panels as follows. The electrical contractor must provide junction boxes for all flush mounted panels. The electrical contractor may utilize junction boxes (as an option to metal panel skirts) to avoid exposed visible cables in electrical closets and electrical rooms. The electrical contractor may utilize junction boxes at other locations and applications if desired, but the boxes and raceways (wherever used) must comply with all of the following requirements.
- 16.2 Locate each junction box above an accessible drop ceiling (or an access panel if ceiling is inaccessible) directly above or as close as practical to the panel. Where junction box is installed to satisfy requirements to hide cable wiring methods, locate outside of the electrical closet/room or inside the closet/room at a perimeter wall so there are no visible cables in the closet/room (except that not more than 300 mm (12") total visible length of each cable is permitted leaving the junction box).
- 16.3 Provide junction boxes and raceways between boxes and panel as indicated below.

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<u>Panel Size (Branch Cct. Poles)</u>	<u>Junction Box Min. Dimensions</u>	<u>Quantity and Size of Conduits</u>
43-Poles & Over (All Double panels)	48"W x 8"H x 8"D (1.2m x 205mm x 205mm) *	(8) 53 mm (2")
31-to 42-Poles	24"W x 8"H x 8"D (0.6m x 205mm x 205mm)	(4) 53 mm (2")
19-to 30-Poles	24"W x 6"H x 6"D (0.6m x 155mm x 155mm)	(3) 53 mm (2")
18-Poles and less	18"W x 6"H x 6"D (460mm x 155mm x 155mm)	(2) 53 mm (2")

* Two (2) 24"W x 8"H x 8"D (0.6 m x 205 mm x 205 mm) junction boxes may be substituted. Provide (2) 78 mm (3") conduit nipples between the junction boxes.

- 16.4 Adjust wiring sizes between each junction box and panel in accordance with NEC de-rating factors. Utilize #8 AWG wiring for branch circuits rated 25 A or 30 A. Utilize #6 AWG wiring for branch circuits rated over 30 A but less than 60 A. Coordinate routing of wiring between junction box and panel with the engineer during construction for all circuits rated over 30 A. Where wiring sizes change due to de-rating considerations, splice wiring in the junction box.
- 16.5 Do not pass the incoming panel feeder and any branch circuits rated 60 A and larger through junction boxes, run this wiring directly into panels. Do not terminate any branch wiring conductors (including grounding conductors associated with each branch circuit) in junction boxes. Terminate conductors only at circuit breakers, ground bus, and neutral bus in panels. Do not splice conductors in junction boxes, except straight-through splicing of two (2) conductors as provided above for de-rating.
- 16.6 Bond each junction box to the panel enclosure with a grounding conductor run in one of the raceways between the panel and junction box. Provide bonding conductor not smaller than the grounding conductor for the panel feeder.

17. DISTRIBUTION PANELS

- 17.1 Distribution panel (distribution panel boards and switchboards) specifications are based on Schneider "I-Line" type. Additional equipment including ABB/GE "AV-Line" type and "Spectra" series, Eaton "Pow-R-Line" type, Schneider #QED type, and Siemens "P-series" (or approved equal) shall be considered.
- 17.2 Provide distribution panels of dead front completely enclosed safety type construction, listed (with all components bearing labels), and of a type suitable for use as service entrance.
- 17.3 Provide thermal-magnetic branch circuit breakers featuring "bolt-on" type modular mounting, facilitating mounting of breakers regardless of breaker frame sizes or poles.
- 17.4 Provide circuit breakers as specified elsewhere in this specification.
- 17.5 Where new "spaces" or "provisions" for circuit breakers are indicated on the drawings or specifications, include all circuit breaker mounting brackets, hardware, bus bar straps, screws, and any other material, equipment, and accessories required to install circuit

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breakers in the future (install in panel spaces). Provide so the only necessary component not furnished as part of provisions is the circuit breaker(s) themselves.

- 17.6 The quantity of provisions (of each respective frame size) specifically indicated on the drawings is the minimum acceptable. If necessary, provide additional branch distribution sections to provide the specified minimum quantity. After satisfying specified minimums, provide additional provisions (of 100 AF, 225/250 AF, and/or 400 AF frame sizes; in any combinations at the manufacturer's/contractor's discretion) so all remaining available circuit branch breaker mounting space in the panel (for the full height of the panel enclosure) consists of provisions.
- 17.7 Provide all compartments (and all main and branch circuit breakers and other equipment therein) completely accessible from the front, unless otherwise indicated on the drawings (regardless if panels are shown against a wall or free-standing).
- 17.8 Provide enclosure consisting of code gauge steel box(es) of galvanized sheet steel of sufficient dimensions to mount panels and to facilitate wiring.
- 17.9 Provide bus bars with ampacity as shown on the drawings (or matching main breaker, where applicable) and with all current carrying parts sized per UL 67 heat rise testing.
- 17.10 Provide panels with copper or aluminum bus bars.
- 17.11 Provide panels with separate ground and neutral busses. Provide neutral bus with provisions for bonding and bond where required by the NEC.
- 17.12 Provide bus bars braced to withstand 100,000 A short circuit current. Provide panels with 100,000 A short circuit rating (A.I.C., I_{sc}), unless indicated otherwise on the drawings (rating on drawings does not apply to bus bracing, provide bracing as indicated above). Provide panels fully short circuit rated, series short circuit rating of panels is not acceptable.
- 17.13 Identify each branch circuit breaker individually with an engraved plastic nameplate as indicated in the section of this specification "Identification, Nameplates and Tags".
- 17.14 Where indicated on the drawings or required by code, provide equipment ground fault protection for main and/or branch circuit breakers.

END OF SECTION

SECTION 16400 - LIGHTING SYSTEM

1. GENERAL PROVISIONS

- 1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications divisions 16100, General Electrical, and 16300, Electrical Materials, are hereby made an integral part of this section.
- 1.2 Provide lighting systems consisting of all components necessary for a complete installation. Refer to the lighting fixture schedule on the drawings for additional information.

2. DRIVERS AND WIRING

- 2.1 Completely coordinate exact lamp types (including configuration, dimensions, etc.), drivers, lighting fixture construction and arrangement (as related to facilitating lamps and related equipment), and all applicable ancillary equipment and provide a complete and compatible installation.
- 2.2 Submit shop drawings of all drivers proposed for use (multiple manufacturers and series are permitted, provided all drivers conform to the specifications). Where lighting fixtures are installed by the contractor which include drivers that do not meet the specifications (without prior written approval) the contractor shall remove drivers and provide new drivers meeting the specified criteria at no cost to the owner.
- 2.3 For lighting shown with 0-10 V dimming, provide with drivers to facilitate dimming. For all light types shown or specified with 0-10 V dimmable drivers (wherever 0-10 V dimming is indicated on the drawings [including lighting fixture schedule] or specifications), provide both power wiring and 0-10 V control wiring to all lighting fixtures. Run control wiring from all lights with 0-10 V dimmable drivers to the respective dimmer or switch controlling the lighting. Where dimmers are shown on the drawings (including combination sensors/dimmers), interconnect control wiring with dimmers as per manufacturer. Where dimmers are not shown on the drawings, install control wiring to the switch (non-dimmed) location and safely insulate and cap off control wiring (to facilitate future replacement of non-dimmed switch with dimmer).

3. LAMPS (LIGHT ENGINES)

- 3.1 Provide all lamps (the term "lamp" includes all light engines of any type which directly emit illumination) as follows. Completely coordinate exact lamp types (including configuration, dimensions, etc.), drivers, lighting fixture construction and arrangement (as related to facilitating lamps and related equipment), and all applicable ancillary equipment and provide a complete and compatible installation.
- 3.2 Provide lamps for lighting fixtures as indicated on the drawings. Provide all lighting fixtures with lamps (even if lamp types and/or quantities are not shown on drawings) to provide a complete installation.

4. LIGHTING FIXTURES

- 4.1 Provide lighting fixture types and manufacturers as indicated on the drawings. Where a lighting fixture type designation (i.e. letter) is not shown at a lighting fixture symbol,

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include costs in bid to provide any applicable type of lighting fixture used for the same symbol anywhere else on the drawings.

- 4.2 Support all lighting fixtures (including outlet boxes and/or conduits used to support lighting fixtures, where permitted) in complete accordance with all applicable requirements of the NEC (including, but not limited to, code requirements for mounting and support of lighting fixtures, outlet and other boxes, conduits, raceways, and devices). Provide all required mounting hardware, including pendant kits, fasteners, hangers, wall mounted brackets, concrete foundations, conduits, supplementary supports, grounding, etc., for a complete installation. Support all lighting fixtures completely independent of suspended ceilings and direct from the structure (suspended ceilings are permitted to provide supplemental lateral support to lighting fixtures which are vertically supported direct from the structure. Supporting lighting fixtures with or from conduits or raceways is not permitted, except that lighting fixtures specifically designed for conduit support may be supported utilizing only rigid steel conduit (supporting with any other type conduit or raceway, including IMC, EMT, PVC, surface raceway, and flexible conduit, is not permitted under any circumstance). Supporting lighting fixtures from screw shells of lamp holders is not permitted under any circumstance. Supporting lighting fixtures or wiring from trees or vegetation is not permitted under any circumstance.
- 4.3 Refer to architectural drawings, reflected ceiling plans, and details for exact locations of all lighting fixtures. Verify final location of all lighting fixtures with the owner, architect, and lighting designer (where applicable) prior to rough-in.
- 4.4 Perform field measurements, verify proper clearances, and verify all exact mounting and installation conditions and requirements prior to ordering lighting fixtures.
- 4.5 Provide integral thermal protection for all recessed lighting fixture housings.
- 4.6 Perform aiming of all adjustable interior lighting fixtures. Include all costs to aim to the satisfaction of the owner, architect, and engineer. This aiming may be performed during normal working hours.
- 4.7 For surface mounted lighting fixtures wired utilizing surface mounted wiring methods, provide wiring entering the side of lighting fixtures. Where fixtures do not facilitate side entry of wiring, provide fixture with manufacturer's back mounting adapter (so wiring enters side of adapter and then enters rear of fixture by passing through adapter). Installing the fixture on surface outlet boxes (in such a way that there is a significant "gap" between the fixture and the wall/ceiling surface) is not acceptable.
- 4.8 All finish colors are selected by the architect/owner. Verify and coordinate any finish colors shown on the drawings (including electrical symbol list, remarks/descriptions on lighting fixture schedule, or colors represented by any catalog number) specifically in detail with the architect/owner before releasing lights. Include costs in bid to utilize any of the available standard and/or optional colors listed in manufacturers' catalogs (excluding any colors identified in manufacturers' catalogs as "custom" or "premium").

5. EXTERIOR LIGHTING

- 5.1 All provisions of the section of this specification "General Lighting" apply to exterior lighting as modified herein.

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6. EMERGENCY AND EXIT LIGHTING

- 6.1 Provide all emergency and exit lighting as indicated on the drawings.
- 6.2 Verify exact mounting, quantity of faces, and directional arrows of all exit signs prior to ordering.
- 6.3 Install all exit signs at general locations as shown on the drawings. Coordinate and obtain approval for exact locations with the architect and local authorities having jurisdiction before installation. Install exit signs to ensure they are completely and clearly visible from the entire covered areas and egress paths.
- 6.4 Perform aiming of all adjustable emergency lighting fixtures. Include all costs to aim to the satisfaction of the owner, architect, engineer, and local authorities having jurisdiction. This aiming may be performed during normal working hours.
- 6.5 Wherever any battery units or battery packs are installed (including batteries integral to lighting fixtures), connect power to the battery units/packs on the line side of all lighting and other control switches so it is impossible to de-energize by turning any switch off.

END OF SECTION

SECTION 16500 - FIRE ALARM SYSTEM

1. GENERAL

- 1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications divisions 16100, General Electrical, and 16300, Electrical Materials, are hereby made an integral part of this section.
- 1.2 Extent of fire alarm, detection, voice alarm, and fire communications system work is indicated on the drawings and schedules. Types of fire alarm and detection equipment includes the following:
 - A. Control panel (with integral annunciation and voice and communications control)
 - B. Audio/visual speaker/strobes and visual strobes
 - C. Manual pull stations
 - D. Smoke, heat, and other automatic fire detectors
 - E. Duct type smoke detectors
 - F. Fire suppression (i.e. sprinklers, etc.) system flow, tamper, pressure, and other supervisory switch connections
 - G. Magnetic door holders
- 1.3 Provide the fire alarm system (including operation, equipment, devices, wiring, installation, and manufacturer's representative services [programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions]) in complete accordance with all applicable federal, state, and local codes and standards (including National Electrical Code (NEC), Institute of Electrical and Electronic Engineers (IEEE), National Fire Protection Association (NFPA), Underwriter's Laboratories (UL), Factory Mutual (FM), American National Standards Institute (ANSI), National Electrical Contractors' Association (NECA) "Standard of Installation", Americans with Disabilities Act (ADA), United States Department of Labor Occupational Safety and Health Administration (OSHA), all local municipal authorities having jurisdiction (local authorities), etc.). Provide fire alarm system controls and all new and existing system components (including devices, equipment, modules, interfaces, etc.) listed to operate together. Provide all signaling devices of an ADA approved type providing ADA approved audible and visual coverage throughout all areas of the project.
- 1.4 These specifications are based on a fire alarm system of the addressable analog type with voice evacuation and fire communications.
- 1.5 Equipment as manufactured by Edwards/EST/UTC, Honeywell (Fire Control Instruments (FCI) and Notifier product lines only), Siemens, and Simplex/Grinnell/Tyco (or approved equal) shall be considered.
- 1.6 Only fire alarm equipment which can be programmed by any approved service vendor and which utilizes non-proprietary coding/programming shall be considered. Only fire alarm manufacturers authorizing at least three (3) independent service vendors in the project area shall be considered. Submit a list of local approved service vendors with shop drawings. Perform manufacturer's representative services (specifically including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) throughout the entire duration of the project, up through final testing and acceptance of the system by the owner and local authorities

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having jurisdiction, include all costs in bid. *No extra consideration, claims, charges, or compensation will be granted under any circumstance for manufacturer's representative services (including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) during the project (specifically including where associated with changes to the scope of work, alternates, unit prices, allowances, etc.) performed before final testing and acceptance of the system.* Extra claims and/or compensation shall only be considered for changes which are initiated after final testing and acceptance of the system.

- 1.7 Where existing fire alarm devices connect to or interface with the new fire alarm system, only fire alarm equipment (i.e. the control panel where devices directly connect to the control panel or interface modules which connect between the control panel and devices) which is listed as compatible with the existing devices shall be considered. The electrical contractor is fully responsible for verifying all requirements and all exact existing devices in the field before submitting shop drawings and shall provide the system accordingly. Include all costs in bid.

2. SUBMITTALS

- 2.1 Submit shop drawings including, but not limited to, shop drawings on equipment and devices (specifically showing manufacturers, model numbers, and listing information), rough in diagrams, detailed project-specific riser and wiring diagrams (specifically showing conductor/cable types and sizes), installation layout drawings (specifically showing locations of all equipment and devices on floor plans [drawn to scale], equipment, and wiring and information on ceiling height and construction [on architectural background plans which shall be made available to the contractor for this purpose], information showing ADA compliant signaling device audible and visual coverage (specifically show all audible device decibel (dB) and visual device candela (cd) settings), and specifically showing interfaces with all fire suppression systems [sprinklers, etc.]), installation instructions, written warranty, detailed zone or addressable device lists (showing each system point identifiable from the control panel and the associated numbered address and detailed description), sequence of operation, power supply wiring information, and power consumption/supply/battery sizing and voltage drop calculations. Submit quantity as indicated elsewhere in the specifications to the engineer for review and approval. In addition to submitting to the engineer, submit additional sets (quantity as per local authorities) to the local authorities having jurisdiction for review, approval, and permits.
- 2.2 Include all costs in bid associated with preparing and submitting shop drawing information. This includes sealing (by a registered professional engineer) diagrams if required by local authorities having jurisdiction.
- 2.3 Upon project completion, submit operation and maintenance (O&M) manuals (include with other project O&M manuals). Submit at least three (3) original copies of all fire alarm system software.
- 2.4 Upon project completion, submit certification of the entire system to the owner and local authorities having jurisdiction.

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3. FIRE ALARM AND DETECTION SYSTEMS

- 3.1 Provide Class "B" alarm and detection system products of types, sizes and capacities indicated, which comply with manufacturer's standard design, materials, and components.
- 3.2 The fire alarm riser diagram on the drawings is approximate as a general guide to system architecture and functioning. Provide exact quantities as specified (based on floor plan drawings, etc.).
- 3.3 Provide a complete fire alarm system with the following sequence of operation and functions.
 - A. Fire Alarm Activation: Actuation of any initiating device (including manual pull stations, automatic smoke, heat, and other fire detectors [including duct detectors, except as specifically provided below], and automatic sprinkler flow switches, etc.) initiates a "fire alarm" and activates all fire alarm signaling, output, and notification devices (including, but not limited to, horns and strobes, HVAC equipment shut-downs, door releases, and central station and fire department alarm notification).
 - B. Trouble Alarm Activation: Any trouble conditions in the fire alarm system (including actuation of fire suppression system tamper/status supervisory switches) initiates a "trouble alarm" and activates central station (and fire department where required) trouble notification and an audio and visual signal at the control panel and remote annunciator (where applicable). "Trouble alarms" do not activate alarm signaling devices or output devices (do not activate door releases [or HVAC equipment shut-downs, except as specifically provided as follows]). Only where code officials specifically require in writing that duct smoke detectors NOT initiating a general "fire alarm", duct detectors shall initiate a "duct smoke supervisory alarm" audio and visual signal at the control panel and remote annunciator and activate appropriate central station (and fire department where required) trouble notification.
 - C. HVAC Equipment Shut-Down: Upon any "fire alarm" (or duct smoke detector activation where duct detectors do not activate fire alarm), shut down HVAC equipment (including all air handling equipment operating at 0.94 m³/s (2,000 cfm) or greater and any other equipment specifically indicated on the drawings or mechanical/ATC specifications) and open/close motorized dampers in accordance with all applicable codes and standards. Provide wiring, conduit, relaying, and final connections from the fire alarm system to ATC controls. Perform all connections at the ATC controls under the supervision of the mechanical/ATC contractor. For equipment operating at 7.08 m³/s (15,000 cfm) or greater provide at least two (2) detectors per unit (supply and return).
 - D. Door Release: Upon any "fire alarm", release all magnetic door holders.
 - E. Central Station and Fire Department Notification: Provide the fire alarm system to facilitate notifying the local fire department in accordance with codes and local authorities having jurisdiction, through the services of an appropriate and central station. Coordinate all requirements (relating to fire alarm system equipment and wiring) with the owner, the owner's central station vendor (where applicable), and local authorities having jurisdiction. As a minimum, provide an individual and

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distinct signal from the fire alarm system for each of the following functions in addition to any other functions required by code:

- 1) Fire Alarm: Upon any "fire alarm" condition initiated any fire alarm device (excluding fire suppression flow/activation and duct smoke detection).
- 2) Sprinkler Alarm: Upon any "fire alarm" condition initiated by any fire suppression flow/activation switch.
- 3) Duct Detector Supervisory: Upon activation of any duct smoke detector.
- 4) Trouble Alarm: Upon any "trouble alarm" condition.

4. MATERIALS, EQUIPMENT, AND DEVICES

4.1 CONTROL PANEL, FIRE ALARM FUNCTIONS: Provide fire alarm control panel surface mounted where indicated on the drawings and including the following items and/or features:

- A. Addressable analog type
- B. UL Listed
- C. Modular design, solid-state construction
- D. Visual alarm and trouble indicators
- E. Automatic ground detection
- F. Double supervision
- G. Alarm verification
- H. Dead front construction
- I. Supervised signal circuit modules (complete and including modules to synchronize visual indicating devices), Class B type
- J. Output devices (HVAC equipment shut-downs, door releases, etc.) relaying, field programmable
- K. Complete power supply including incoming power overvoltage surge (lightning) protection
- L. Battery backup (to operate the system under "normal", "trouble", and "alarm" conditions as per code, but not less than a minimum of 24 hours and then operate the system in "alarm" condition for a minimum of 15 minutes at the end of the 24 hour period), including charger and batteries, fully supervised and automatic
- M. Auxiliary contacts, minimum of 10, field programmable
- N. Equipment, devices, modules, and wiring for central station and fire department notification and tie-in; including telephone dialer, telephone line interface, transmitter, telephone line wiring, etc.. Provide a telephone/data outlet (see symbol list on drawings) at control panel for tie-in.
- O. Device termination module
- P. Detector loop module, Analog type
- Q. Integral keyboard display and interface module
- R. Provide power to (obtain from power circuit for main control panel) and smoke detector(s) located to provide protection/coverage (in accordance with NFPA-72 requirements) for the main fire alarm control panel, all sub- or slave- control panels, all power supplies, all remote indicating controllers, and related equipment, whether shown on the drawings or not.

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Where remote indicating control appliance relays and/or modules are required for control of ADA signaling devices, mount integral to the control panel enclosure or in a single separate enclosure directly adjacent to the control panel. Batteries may be mounted in the control panel enclosure or in a separate single enclosure.

- 4.2 CONTROL PANEL, VOICE/COMMUNICATIONS FUNCTIONS: Provide fire alarm control panel including the following voice/communications items and/or features:
- A. Pre-recorded evacuation messages using solid-state electronics
 - B. Voice evacuation system paging from any annunciator
 - C. Dual channel functioning
 - D. Speaker/telephone zone select switches
 - E. Audio amplifiers, including standby and backup amplifiers
 - F. Field recorded digital message
 - G. All call feature
- 4.3 COMBINATION SPEAKER AND STROBE ASSEMBLIES: Provide combination speaker and flashing strobe audible and visual notification appliances with code approved wording "FIRE". Provide listed, flush mounted (mount on flush outlet box), ADA approved type wired using Class "B" supervised circuits. Provide listed for wall or ceiling mounting as applicable. Only appliance types featuring both listed wall mounting models and listed ceiling mounting models or models listed for both wall and ceiling mounting shall be considered. For all dwelling units and for sleeping areas in other occupancies, utilize only devices capable of NFPA compliant low-frequency (nominal 520 Hz) operation. Provide visually synchronized (utilizing synchronized type appliances in conjunction with suitable synchronizing control modules in signaling circuits) to prevent photosensitive reactions. Provide with adjustable output settings (78, 82, 84, 87, 90, 93, and 95 dBA audible and 15, 30, 75, and 95 or 110 cd visual). Base pricing and wiring and power supply sizing on maximum settings. Lower output settings shall be considered only where they provide audible and visual coverage meeting or exceeding ADA and code requirements (throughout all areas of the project where coverage is required or otherwise shown on the drawings) and where the manufacturer submits calculations/criteria showing compliant coverage. Include costs in bid to provide additional signaling appliances where necessary to provide compliant coverage.
- 4.4 STROBE ONLY ASSEMBLIES: Provide flashing strobe visual notification appliances with code approved wording "FIRE". Provide listed, flush mounted (mount on flush outlet box), ADA approved type wired using Class "B" supervised circuits. Provide visually synchronized (utilizing synchronized type appliances in conjunction with suitable synchronizing control modules in signaling circuits) to prevent photosensitive reactions. Provide with adjustable output settings (15, 30, 75, and 95 or 110 cd). Base pricing and wiring and power supply sizing on maximum settings. Lower output settings shall be considered only where they provide audible and visual coverage meeting or exceeding ADA and code requirements (throughout all areas of the project where coverage is required or otherwise shown on the drawings) and where the manufacturer submits calculations/criteria showing compliant coverage. Include costs in bid to provide additional signaling appliances where necessary to provide compliant coverage.

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- 4.5 **MANUAL PULL STATIONS:** Provide station semi-flush mounted (mount on flush outlet box), of the non-coded double-action type with key reset switch. Provide each pull station individually addressed and interfaced to addressable fire alarm system utilizing a suitable addressable monitor module (integral to station or a separate module mounted in the station outlet box).
- 4.6 **SMOKE DETECTORS:** Provide detector of the dual chamber, solid state photoelectric, addressable, and analog type arranged for two-wire, non-polarized installation. Provide detector of low profile design, white in color, and with twist-lock base for mounting on standard flush outlet box.
- 4.7 **HEAT DETECTORS:** Provide detector functioning on both fixed temperature (rating as indicated on the drawing, unless otherwise required as noted below) and rate-of-rise principals of operation. Provide addressable and analog type arranged for two-wire, non-polarized installation, of low profile design, white color finish, and with twist-lock base for mounting on standard flush outlet box. For areas where ambient temperatures may normally exceed 38 degrees C (100 degrees F), such as unconditioned attic spaces or spaces which are not insulated, utilize detectors with temperature ratings as recommended by the detector manufacturer for the application (detectors rated 80 degrees C (175 degrees F) or greater may utilize fixed temperature sensing only [rate-of-rise sensing is not required for these detectors]). Verify all requirements associated with temperature ratings with manufacturer in detail before purchasing detectors or rough-in (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with temperature ratings of heat detectors).
- 4.8 **DUCT TYPE SMOKE DETECTORS:** Provide suitable duct housing with detector (as indicated above), sampling tubes (coordinate with ductwork), addressable relay for HVAC shutdown interface, and remote mounted test/reset/indicating station. Arrange addressable relay to shutdown HVAC equipment upon addressable signal from the fire alarm control panel. Provide addressable HVAC shutdown relay either integral to (and part of) duct housing or separately mounted directly adjacent to the duct housing. Detector or housing auxiliary contacts or relay operating only when the individual duct smoke detector is in alarm condition are not acceptable. Where either the HVAC equipment and/or any associated ductwork are new or modified, mechanical contractor shall install detector on ductwork and provide all HVAC shutdown interface wiring from relay to HVAC equipment. Where both the HVAC equipment and all associated ductwork are existing to remain, electrical contractor shall install detector on ductwork (as directed by and under the supervision of the mechanical contractor and mechanical engineer) and provide all HVAC shutdown interface wiring from relay to HVAC equipment (making final connections at HVAC equipment as directed by and under the supervision of the mechanical contractor and mechanical engineer). Electrical contractor shall furnish detector and associated equipment, provide all wiring and connections to fire alarm system, and install the remote test/reset/indicating station in all circumstances.
- 4.9 **FIRE SUPPRESSION SUPERVISORY AND OTHER ACTUATION DEVICES:** Interconnect and monitor every fire suppression system (including systems utilizing sprinklers [including fire pump where applicable], carbon dioxide, foam, chemical, halogen, deluge, pre-action, standpipes, etc. where applicable) supervisory device (including flow, pressure, tamper, etc. switches) to the fire alarm system. Interconnect and

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monitor every fire actuation device part of or installed along with architectural or mechanical equipment and apparatus (including smoke and/or fire dampers [including those in ducts, at shafts, and for ceiling radiation], smoke and/or fire doors, gates, grills, and shutters, fan control, and other similar equipment/apparatus) to the fire alarm system. Provide suitable addressable monitor modules and all wiring for complete connections between each monitored device and the fire alarm system. Supervisory and actuation devices shall be furnished and installed on fire suppression systems, equipment, and apparatus by the respective installing contractor and wired to the fire alarm system by the electrical contractor. Connect supervisory and actuation devices whether shown on the electrical drawings or not. Review fire protection, mechanical, and architectural drawings and coordinate with fire protection, mechanical, and general contractors before submitting bid and include all costs in bid.

- 4.11 SUPERVISORY AND CONTROL DEVICES: Interconnect each supervisory and control device (other than fire suppression system devices) specifically indicated on the drawings to the fire alarm system. Provide suitable addressable monitor modules and all wiring for complete connections between each monitored device and the fire alarm system.
- 4.12 RELAY INTERFACES: Provide a suitable addressable output module for control relay interconnection to the addressable fire alarm system. Provide all wiring for complete connections to the respective controlled device. Provide output modules for all HVAC shutdown connections, magnetic door holders, etc.
- 4.13 Wherever non-addressable ("conventional") style devices remain, are specified, or are otherwise required for the project (i.e. to satisfy code requirements or where addressable devices are not approved by NFPA, UL, or FM for the application) in conjunction with the addressable system, provide each device individually addressed utilizing a suitable addressable monitor module. Verify all requirements before submitting bid and include all costs in bid.

5. LOCKS AND KEYS

- 5.1 Refer also to the section of this specification "Locks and Keys" of specifications section 16300 "Electrical Materials".
- 5.2 Provide all fire alarm equipment cabinets and enclosures with locking covers/doors. Provide enclosures and key operated devices (including pull stations and duct detector test/reset stations) keyed alike.

6. INSTALLATION

- 6.1 Provide fire alarm wiring in complete accordance with all requirements of other sections of the electrical specifications, except as modified below. Utilize wiring methods in accordance with specifications section 16200 "Electrical Work Practices".
- 6.2 Provide all fire alarm system wiring as directed, recommended, and approved by the system manufacturer and meeting all system manufacturer minimum requirements (including where manufacturer's requirements exceed the requirements of the specifications and the

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NEC). #14 AWG conductors are the minimum permitted. Provide all wiring utilizing solid conductors. Stranded conductors are permitted only where in accordance with NEC Article 760. The fire alarm system may utilize individual conductors wiring in conduit and/or multi-conductor cables (in conduit where otherwise required by the specifications).

- 6.3 Provide multi-conductor cables (where utilized) as follows. Provide insulation rated not less than 300 V. Utilize only cables having an overall red jacket and approved by the NEC and NFPA for use with fire alarm systems. Plenum rated cables may be utilized, but only in dry locations (plenum cables, even when installed in conduit, are prohibited in damp and wet locations). In damp locations, utilize only cables specifically listed and identified for use in damp or wet locations. Provide all cables in wet locations (including underground and embedded in concrete slabs at or below grade) specifically designed for outdoor and submerged use and specifically listed and identified for use in wet locations.
- 6.4 Provide raceways for the fire alarm system dedicated to fire alarm wiring. Do not run other systems (including power, lighting, controls, telecommunications, etc.) in fire alarm raceways. Where fire alarm wiring is recommended or required by the manufacturer to be separated from other fire alarm wiring due to noise, interference, or other concerns, install wiring in separate raceways (or physically separate wiring as per manufacturer recommendations where wiring is permitted elsewhere to run without raceway). Paint outlet, junction, device, and other boxes, conduit bodies, and covers associated with the fire alarm system red. Paint exposed fire alarm raceways red.
- 6.5 Identify fire alarm equipment, devices (as listed below), and wiring as indicated in specifications section "Identification, Nameplates, and Tags" of specifications division 16300, Electrical Materials.
 - A. Provide an engraved laminated plastic nameplate on the front cover of the fire alarm control panel reading, "FIRE ALARM CONTROL PANEL - 120V, 20A - PP1, CCT. 4"). Indicate the panel and circuit number feeding the control panel. Provide similar nameplates at all power supply units, auxiliary power supplies, and signaling circuit power extender modules.
 - B. Provide red engraved laminated plastic nameplates with 6.5 mm (1/4") high (minimum) white letters at each pull station reading "IN CASE OF FIRE: SOUND ALARM AND CALL 911" (or "IN CASE OF FIRE: SOUND ALARM AND CALL THE FIRE DEPARTMENT" where the building telephone system does not facilitate directly dialing 911), "FIRE ALARM DOES NOT CALL FIRE DEPARTMENT", or with other wording as directed by local authorities having jurisdiction.
 - C. Provide two (2) engraved laminated plastic nameplates for each duct type smoke detector, one (1) on the detector housing and one (1) on the remote test/reset/indicating station. List the name and description of the equipment served (i.e. "#AHU-1 - AIR HANDLING UNIT", etc.). Utilize 3.2 mm (1/8") high minimum lettering.
 - D. Suitably label (in an engineer and owner approved method) all addressable fire alarm devices (manual pull stations, smoke detectors, heat detectors, duct type smoke detector housings, duct smoke detector test/reset/indicating stations, supervised output relay modules, identification modules, etc.) with the respective system

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address. Labeling annunciator(s) is not required. Labeling signaling devices and magnetic door holders is not required, except that labeling is required for any associated addressable relays.

- 6.6 For all existing fire alarm devices (initiating or signaling, of any kind), components, and functions required to remain active and/or operational (by code, by the owner, or by local authorities having jurisdiction) which are not shown as new or replaced by the new fire alarm system, interface and connect (utilizing wiring and new system modules, etc.) existing devices, components, and functions to the new fire alarm system to maintain operation. Provide whether shown on the drawings or not.
- 6.7 Where replacing existing fire alarm devices with new devices, existing locations may be used where practical, provided NFPA required coverage is maintained and provided it does not represent a change in scope of work. Where replacing devices in existing drop ceilings which remain, reuse existing ceiling tiles and install new devices in existing holes in tiles (reuse existing holes). Relocate tiles within ceiling for proper device locations. Removing existing devices in such a manner which leaves exposed openings (holes) in tiles is not acceptable. Patching holes in tiles and using blank cover plates to close holes in tiles are not acceptable. Where required to avoid leaving holes, patching, and blank covers, provide (at the electrical contractor's expense) new ceiling tiles to match existing (submit shop drawings [and samples, if requested] of ceiling tiles to the architect and owner for review and approval).

7. QUALITY ASSURANCE

- 7.1 Completely test the entire system as per "Testing" in specifications section 16100 "General Electrical". Perform the following additional testing.
- 7.2 Completely test the entire system to demonstrate proper operation, functioning, capability, and compliance with all code and specification requirements. Inspect equipment, devices, relays, signals, etc. for malfunctioning. Correct malfunctions and retest to demonstrate satisfying the above requirements. Perform all testing in complete accordance with all applicable NFPA-72 standards and testing procedures.
- 7.3 The electrical contractor and manufacturer's representative shall fully certify (in writing) the entire system and system operation, including documenting successful testing of the system. Submit copies of certification to the owner and local authorities having jurisdiction.
- 7.4 Provide manufacturer's representative services performed by specially trained personnel employed by the fire alarm system manufacturer's representative. Perform manufacturer's representative services (specifically including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) throughout the entire duration of the project, up through final testing and acceptance of the system by the owner and local authorities having jurisdiction, include all costs in bid. *No extra consideration, claims, charges, or compensation will be granted under any circumstance for manufacturer's representative services (including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) during the project*

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(specifically including where associated with changes to the scope of work, alternates, unit prices, allowances, etc.) performed before final testing and acceptance of the system. Extra claims and/or compensation shall only be considered for changes which are initiated after final testing and acceptance of the system.

- 7.5 Provide a demonstration period of two (2) full working days to instruct owner's personnel in the operation and maintenance of the system.

8. WARRANTY AND SERVICE CONTRACT

- 8.1 Provide a written warranty on all equipment in accordance with "Guarantee and Warranties" in specifications section 16100 "General Electrical".
- 8.2 Make a service contract available to the Owner after the warranty expires. The owner may accept or decline service contract at the owner's discretion.

END OF SECTION