



**Burlington County Agricultural Center –
2026 Improvements
500 Centerton Road
Moorestown, NJ 08057**

CPU PROJECT NO. CPU-26-0051

**for the
Burlington County Board of County Commissioners
49 Rancocas Road
Mount Holly, New Jersey 08060**

GENERAL DOCUMENTS AND SPECIFICATIONS

June 30, 2026

PREPARED BY:



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A handwritten signature in black ink, appearing to read "S. Taylor".

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**SECTION 00050
PROJECT SUMMARY**

1. PROJECT NAME AND LOCATION:

Burlington County Agricultural Center- 2026 Improvements
500 Centerton Road
Moorestown, NJ 08057

2. PROJECT SCOPE:

The project scope will consist of the following:

Furnishing of all materials, equipment, services and labor necessary to construct proposed improvements to the Burlington County Agricultural Center including but not limited to new restroom building, brick walkways, site lighting, fencing, signage, landscaping, irrigation and other park appurtenances.

Trades Required:

- General Construction
- Plumbing
- Electrical
- Mechanical

3. PROJECT PHASING

The facility will be open to the public during the contract. Public events are scheduled between April 1st and December 1st. The facility is also actively farmed by a tenant farmer. The contractor shall minimize closure time and expedite opening of portions of the facility when safely possible.

4. CONTRACT TIME:

Start date: Within 14 days from Notice to Proceed
December 1, 2026 for construction activities
Completion Date: All work shall be completed within 120 calendar days from date of issuance of Notice to Proceed.
April 1, 2026 for completion construction activities.

5. **LIQUIDATED DAMAGES:**

\$3,000 Per Calendar Day

6. **OWNER:**

Burlington County Board of County Commissioners
P.O. Box 6000
49 Rancocas Road
Mount Holly, NJ 08060

7. **OWNER'S REPRESENTATIVE:**

Taylor Design Group, Inc.
131 Hartford Road
Mount Laurel, NJ 08054
Telephone: 856.810.3443
Attention: Steven Lennon, LLA, PP, Director of Projects

8. **BID OPENING**

Date: September 16, 2026
Time: 10:30 AM (Local Time)
Location: <https://burlcobids.ionwave.net>

All bids shall be submitted online at <https://burlcobids.ionwave.net> the County shall not accept any bids submissions via email, courier, mail, or in person delivery. The County is not responsible for any bid not submitted on time at <https://burlcobids.ionwave.net>. The County is not responsible for any internet submission issues that may include but not be limited to connection issues, technical difficulties, errors, power outages, etc.

At the time fixed for the opening of bids, their contents will be read and made public for the information of bidders and other interested persons. Bidders and interested persons may watch the bid opening online. Details on accessing the online bid opening can be found under the "Event Details" tab for this solicitation at <https://burlcobids.ionwave.net>.

9. **COST OF BID PACKAGE:** No Charge

10. **SITE VISITS:**

The site is open to the public dawn to dusk and access is available to prospective bidders. The facility is also actively farmed by a tenant farmer so please use caution during any site visit.

11. PRE-BID CONFERENCE:

AUGUST 26, 2026 AT 10:00 A.M.
Commissioner's Board Room located at 49 Rancocas Road,
Mount Holly, NJ 08060.

12. DEADLINE FOR QUESTIONS:

August 31, 2026, 5:00 PM (local time)

All questions must be submitted at <https://burlcobids.ionwave.net> by the deadline.

No questions will be answered after this date.

13. THE CONTRACT DOCUMENTS:

Landscape Architect ID No.: 2005-108.21.02
Drawing Date: June 30, 2026; June 29, 2026 OSK
Specification Date: June 30, 2026
County ID No.: CPU-26-0051

*****END OF SECTION 00050 - PROJECT SUMMARY*****

SECTION 00100 INSTRUCTIONS TO BIDDERS

THESE INSTRUCTIONS ARE IN ADDITION TO THOSE STIPULATED IN THE BURLINGTON COUNTY GENERAL CONDITIONS HEREIN ENCLOSED.

1. LOCATION OF BID OPENING: Sealed bids will be received, publicly opened and read aloud by the Contracting Agent for the Board of County Commissioners of the County of Burlington, New Jersey, on date, time and location of bid opening as stated in the Project Summary– Division 0, Section 00050. Information regarding attendance at the bid opening can be found on the County’s electronic procurement platform located at <https://burlcobids.ionwave.net>.
2. OBTAINING DRAWINGS AND SPECIFICATIONS: Drawings and Specifications can be obtained on the County’s electronic procurement platform located at <https://burlcobids.ionwave.net>. New prospective bidders must register on the electronic procurement platform located at burlcobids.ionwave.net to access the bid instructions and specifications. Registration is also required to receive information regarding future solicitations. Please complete all fields as requested. There is no cost to register on the electronic platform and access the specifications. Paper copies or CD’s will not be provided by the County. Documents will be provided at no cost to the bidder.
3. ADDRESSING AND DELIVERY OF BID SUBMISSION: All bids shall be submitted online at <https://burlcobids.ionwave.net> the county shall not accept any bids submissions via email, courier, mail, or in person delivery. The County is not responsible for any bid not submitted on time at <https://burlcobids.ionwave.net>. The County is not responsible for any internet submission issues that may include but not be limited to connection issues, technical difficulties, errors, power outages, etc.
4. TYPE OF BID: The bidder shall deliver an overall Total Amount Bid for all work delineated on the Drawings and described in the Specifications. A summary of which is listed as: Project Summary – Division 0, Section 00050. Bidders shall refer to the Bid Form for additional information.
5. COMPLETE BID: Bidders must submit all documents marked “mandatory” on the Bidder’s Checklist for the bid to be accepted and considered by the County. All bid documents, including those marked mandatory, are to be submitted electronically at <https://burlcobids.ionwave.net>. Please see Section 00400 BIDDERS CHECKLIST for a list of all required documents.
6. LATE BIDS: **No late bid will be accepted or considered.** The County will not be responsible for any bid not submitted on time due to internet, website, or any other technical difficulty. This shall include but not be limited to power outages, internet disconnections, computer complications, website errors, etc. It is the bidder’s responsibility to ensure that the bid is prepared and submitted in a timely fashion to navigate technical and digital complications.
7. BIDDERS RESPONSIBILITY BY SUBMITTING A BID, BID WITHDRAWAL, and ERRORS ON THE BID FORM: By submitting a bid the prospective bidder covenants and agrees that they fully understands their obligations.

N.J.S.A. 40A:11-23.3:

- a. In the case of a bidding process for a public works contract, a bidder may request withdrawal of a bid, due to a mistake on the part of the bidder, within five business days after a bid opening. As used

in this section, "mistake" shall have the same meaning as provided in paragraph 42 of section 2 of P.L.1971, c.198 (C.40A:11-2).

b. To request the withdrawal of a public works bid, a bidder shall submit a request for withdrawal in writing by certified or registered mail to the address to which the bid was submitted. The request shall be effective upon mailing. The request shall include evidence, including any pertinent documents, demonstrating that a mistake was made and was of so great a consequence that:

- (1) the enforcement of the contract, if actually made, would be unconscionable;
- (2) the mistake relates to a material feature of the bid;
- (3) the mistake occurred notwithstanding the fact that the bidder exercised reasonable care in preparation of the bid; and
- (4) the bidder making the mistake is able to get relief by way of withdrawing the bid without serious prejudice to the contracting unit, except for the loss of the bargain to the contracting unit.

c. A purchasing agent qualified pursuant to subsection b. of section 9 of P.L.1971, c.198 (C.40A:11-9), or legal counsel for the contracting unit, or the chief administrative officer of the contracting unit, shall review the request for bid withdrawal. No later than the next meeting of the governing body of the contracting unit following receipt of the withdrawal request, the individual responsible for reviewing the request shall make a recommendation to the governing body of the contracting unit concerning the disposition of the request. The governing body of the contracting unit shall act upon the request to withdraw the bid no later than at its next regular meeting.

d. The purchasing agent, legal counsel, or chief administrative officer responsible for reviewing the request pursuant to subsection b. of this section, shall act in good faith in reviewing the request and in making a recommendation to the governing body concerning the disposition of a request to withdraw a bid.

e. A contracting unit whose governing body grants a request to withdraw a bid shall return the bid guarantee to the bidder. Once the decision to approve the withdrawal is made, the contracting unit shall continue the award process with the remaining bids.

f. If a bidder withdraws a bid, the bidder shall be disqualified from future bidding on the same project, including whenever all bids are rejected pursuant to section 21 of P.L.1999, c.440 (C.40A:11-13.2).

8. **SIGNATURE ON THE BID FORM:** Bids must be electronically signed and submitted per the requirements at <https://burlcobids.ionwave.net>. Scanned copies of the bid specification will not be accepted. The County will not accept any bid submissions through alternative methods including but not limited to email, fax, hand delivery, courier, mail, etc.

Unit Prices, Allowances, Line Item Amounts, Alternates, and Total Bids are to be submitted in the spaces provided under the "Line Items" section of this solicitation at <https://burlcobids.ionwave.net>

Failure to electronically sign, give all information, complete, and submit the bid may result in the rejection of the bid.

9. SITE VISITS PRIOR TO BID SUBMISSION: Prospective bidders are highly recommended to visit the site prior to submitting a bid and become thoroughly familiar with existing conditions. However, by submission of this bid, the Contractor warrants that they are familiar with all site conditions as if he had visited the site for inspection. Site visits are by appointment only. Instructions for scheduling a site visit can be found in Project Summary, Division 0, Section 00050.
10. QUESTIONS DURING THE BID PERIOD: No questions raised at the pre-bid meeting (if applicable) are binding. For binding answers, all questions must be submitted in writing at <https://burlcobids.ionwave.net> under the "Questions" tab by the deadline for questions as listed in the Project Summary, Division 0, Section 00050. **Questions submitted to the County or County's Representative via email or fax will not be responded to.** A written addendum will be emailed to all prospective bidders currently on record, no later than seven (7) working days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addenda or interpretation shall not relieve any bidder from any obligation under their bid as submitted. All Addenda so issued shall become part of the Contract Documents.
11. ANSWERS DURING THE BID PERIOD: All questions will be answered in writing. Neither the County nor their authorized representative will be responsible in any way for oral answers unconfirmed in writing, to any inquiries regarding the answer, intent or meaning of the drawings or the specifications.
12. BID GUARANTEE: Bids must be accompanied by a bid guarantee in the form of a bid bond, certified check, or cashier's check in the amount of **10% of the amount bid, not to exceed \$20,000.00** and shall be made payable to the Burlington County Treasurer. Bidders submit a copy of the bid guarantee online as part of the electronic bid submission. Additionally, the bidder must mail or deliver the original bid guarantee to the County. The original bid guarantee must be mailed or delivered to the County in a sealed envelope with the bid title and number clearly marked on the outside. The original bid guarantee is due to the County no later than the deadline for receipt of bids. Failure to comply will result in rejection of the bid.

The original bid guarantee can be delivered by hand or courier to:

County of Burlington
Department of Finance and Purchasing
County Office Building
First Floor, Room 104
49 Rancocas Road
Mount Holly, NJ 08060-6000

The original bid guarantee can be mailed to:

County of Burlington
Department of Finance and Purchasing
49 Rancocas Road
Post Office Box 6000
Mount Holly, NJ 08060-6000

13. BID GUARANTEE RETURN:
The county shall award the contract or reject all bids within such time as may be specified in the invitation to bid, but in no case more than 60 days, except that the bids of any bidders who consent thereto may, at the request of the contracting unit, be held for consideration for such longer period as may be agreed. All bid security, except the security of the three apparent lowest responsible bidders,

shall be returned, unless otherwise requested by the bidder, within 10 days after the opening of the bids, Sundays and holidays excepted, and the bids of such bidders shall be considered as withdrawn. Within three days, Sundays and holidays excepted, after the awarding and signing of the contract and the approval of the contractor's performance bond, the bid security of the remaining unsuccessful bidders shall be returned to them.

14. **CONSENT OF SURETY FOR A PAYMENT & PERFORMANCE BOND MUST ACCOMPANY ALL BIDS:** To insure that a Payment and Performance Bond will be provided as required by the Contract Documents, a Certificate from a Surety Company to provide a Payment and Performance Bond (Consent of Surety) is required. This Consent of Surety must be submitted to the Board of County Commissioners of the County of Burlington along with the Contractor's bid submission using the form provided in Section 430 of Division 0 of this Solicitation.

Failure to submit the Consent of Surety on the attached form at the time of the Contractor's bid submission constitutes a material deviation from the specifications and will cause the bid to be rejected.

The Consent of Surety must be drawn to the Board of County Commissioners of the County of Burlington in the amount equal to 100% of the Contractor's bid amount. A Power of Attorney appointing the person signing the form as Attorney-in-Fact must also be attached to the form and submitted with the Contractor's bid submission. The Consent of Surety must be valid for a period of no less than ninety (90) days from the date of bid opening.

The surety company providing the Consent of Surety and Payment and Performance Bond must be authorized pursuant to the New Jersey Statutes to carry on business in the State of New Jersey and subject to the requirements outlined in the General and Supplemental Conditions of the Contract.

15. **AWARD:** The County will award the contract to the lowest responsible bidder. The County shall have the exclusive right to accept one or more of the alternates identified in the Contract Documents in the order listed per N.J.S.A. 40A:11-23.1(d). If the County exercises this right, the acceptance of such alternate or alternates will be awarded in numerically ranked order listed on the bid form and shall be used in calculating the overall contract sum, and in determining which bidder has the lowest aggregate bid

The successful bidder to whom the award is to be made, will be notified in writing upon formal acceptance of the bid by the Board of County Commissioners.

Until the Division of Purchase receives an approved performance bond, no bid will be accepted and no Contract will be awarded. After receipt of a approved performance bond and other submissions required by the bid specifications in Section 400 of Division 0, the bid will be accepted and a signed Contract and purchase order will be forwarded to the successful bidder. The County will then notify the Architect to issue the "Notice to Proceed".

16. **REJECTION OF ALL BIDS:** Pursuant to N.J.S.A. 40A:11-13.2, the County of Burlington may reject all bids for any of the following reasons:
 - a. The lowest bid substantially exceeds the cost estimate for the project;
 - b. The lowest bid substantially exceeds the County's appropriation for the project;

- c. The Board of County Commissioners decides to abandon the project;
- d. The County wants to substantially revise the specifications for the project;
- e. The purposes of provisions or both of the New Jersey Local Public Contracts Law (N.J.S.A. 40A:11-1 et seq.) are being violated;
- f. The Board of County Commissioners decides to use the State authorized contract pursuant to N.J.S.A. 40A:11-12.

If all bids are rejected, bid guarantees will be returned with three (3) days of the date of determination to reject.

17. **COMMENCEMENT OF THE WORK:** The County of Burlington does not authorize the expenditure of any monies by the successful bidder, including that undertaken through the ordering of goods or materials, prior to the receipt by the successful bidder of (1) a Contract signed by the County, (2) a purchase order issued by the County of Burlington, Division of Purchase, and (3) a Notice to Proceed from the Architect.

Any such expenditure of monies by the successful bidder prior to the receipt of all three items will be at the bidders own risk.

18. **FAILURE TO EXECUTE THE CONTRACT:** If the successful bidder fails to enter into such contract or fails to meet the performance bond and insurance requirements within ten (10) days after the award or neglects to perform after acceptance of bid by the County then the check or security deposited by them shall, at the option of the Board of County Commissioners, be retained by such Board as liquidated damages, or if a bid bond has been supplied, principal and surety shall be liable for the amount of the bid.
19. **LAW AGAINST DISCRIMINATION:** As per N.J.S.A. 40A:11-13, the successful bidder shall be prohibited from discrimination in the hiring of persons who are qualified and available to perform work to which the contract relates by reasons of race, religion, sex, national origin, creed, color, ancestry, age, marital status, affectional or sexual orientation, familial status, liability for service in the Armed Forces of the United States, or nationality in accordance with State of New Jersey Law.

Bidders shall be required to complete an Anti-Discrimination Agreement under the Attributes tab within the solicitation located at <https://burlcobids.ionwave.net>. The successful bidder shall comply with the anti-discrimination provisions during the term of the contract pursuant to N.J.S.A.10:2-1.

20. **AFFIRMATIVE ACTION:** All bidders are required to comply with the requirements of N.J.A.C. 17:27 et seq., as supplemented and amended.
21. **PREVAILING WAGE RATES & CERTIFIED PAYROLL:** When applicable, the Contractor shall pay the latest prevailing wage rates, for projects in excess of \$2,000.00 as determined by the Commissioner of Labor and Workforce Development of the State of New Jersey, for the locality in which the work is to be performed pursuant to N.J.S.A. 34:11-56 et seq. A schedule of such is available from the Public Contracts Section, Office of Wage and Hour Compliance, CN 389, Trenton, NJ 08625-0389, telephone number (609) 292-2259. The Contractor shall comply with all applicable

statutes and regulations regarding the payment of wages and specifically Title 34, Chapter 11, of the Revised Statutes of New Jersey. In the event it is found that a worker employed by the Contractor under this contract has been paid a rate of wages less than the prevailing rate required, the County may terminate the Contractor'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. The Contractor and their sureties shall be liable to the County for any excess costs occasioned thereby. Contractor is responsible for using the schedule most current at the time of the signing of the Contract. It is the intention of the parties that the contractor comply with all applicable statutes and regulations regarding the payment of wages including but not limited to the following:

- a. The public works employer (any natural person, company, firm, subcontractor or other entity engaged in public work) **must submit a certified payroll record** (on a form satisfactory to the Commissioner of Labor and Workforce Development, copy attached) for each payroll period within 10 days of the payment of wages. [N.J.A.C. 12 : 60et seq.] to the following entities:

Burlington County Treasurer's Office
49 Rancocas Road
P.O. Box 6000
Mt. Holly, NJ 08060-6000
Attention: Auditing
(paper submission required)

AND

The New Jersey Wage Hub
[New Jersey Wage Hub \(nj.gov\)](https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/)
(electronic submission as required by
P.L. 2023, c. 164)

- b. No award of the contract will be made to a bidder on the debarred list of the Commissioner of Labor. N.J.S.A. 34:11-56.38.

The successful bidder shall refer to prevailing wage rate determinations, located on the NJ State Department of Labor and Workforce Development website (see link below).

Link: <https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/>

22. THE PUBLIC WORKS CONTRACTOR REGISTRATION ACT: The Legislature has established a registration system for contractors engaged in public works projects to better enforce existing labor laws and regulations in the public works industry.

"Contractor" means a person, partnership, association, joint stock company, trust, corporation, or other legal business entity or successor thereof who enters into a contract which is subject to the provisions of the "New Jersey Prevailing Wage Act," P.L.1963, c.150 (N.J.S.A. 34:11-56.25 et seq.) for the construction, reconstruction, demolition, alteration, repair or maintenance of a public building regularly open to and used by the general public or a public institution.

"Worker" includes laborer, mechanic, skilled or semi-skilled laborer and apprentices or helpers employed by any contractor engaged in the performance of services directly upon a public work, regardless of whether their work becomes a component part thereof, but does not include material suppliers or their employees who do not perform services at the job site.

Proof of registration pursuant to the Public Works Contractor Registration Act for the general contractor must be submitted with the bid. Proof of such registration shall be in the form of a current Certificate of Registration issued by the New Jersey Department of Labor, Division of wage & Hour Compliance.

No contractor shall bid on or engage in any contract for public work as defined in section 2 of P.L.1963, c.150 (N.J.S.A. 34:11-56.26 et seq.) unless the contractor is registered pursuant to this act.

A contractor shall register with the Department of Labor on a form provided by the commissioner.

Contractor Registration Unit
New Jersey Department of Labor
Division of Wage & Hour Compliance
P.O. Box 389
Trenton, NJ 08625-0389
Telephone: (609) 292-9464 Fax: (609) 633-8591

Upon receipt of the fee, form and documentation required by section 5 of this act, the commissioner shall issue a certificate of registration to the contractor. A registration certificate shall be valid for one calendar year from the date of registration.

Registrations shall be renewed not less than 30 days before the expiration date of the immediately preceding registration.

Bidders shall be required to submit a copy of their company's and prime subcontractor's valid Public Works Contractor Registration Certificate (PWCRC) with their bid for public work.

23. DISQUALIFICATION OF BIDDERS: Pursuant to N.J.S.A. 40A:11-4, the County may disqualify a bidder who would otherwise be determined to be the lowest responsible bidder, if the governing body finds that it has had prior negative experience with the bidder. Bids for this Contract will only be considered from bidders not listed on any debarred list published by the State of New Jersey or any federal government agency
24. LICENSES: All trades requiring licenses shall provide them and maintain them during the duration of the project.
25. IDENTIFICATION: All employees of successful Contractor shall have proper photo identification in their possession when performing duties relating to this Contract within or upon County property.
26. AMERICAN MADE GOODS: Wherever available, only products or items manufactured in the United States of America shall be furnished per this solicitation in accordance with the Local Public Contract Law at N.J.S.A. 40A: 11-18.
27. BRAND NAMES: Any specific references to name brands, manufacturers or products are made to establish the level of quality required and should be interpreted to read "or equivalent". If material other than that specified is bid, it is the bidder's responsibility to name such within the bid and to prove to the County that said item is equivalent to that specified and to submit brochures, samples and/or detailed specifications on the item. The County and its professionals, including but limited to the Engineer(s) and Architect(s), shall be the sole determiner of the equivalency of such a non-listed product or manufacturer with those enumerated in the specifications.

28. RELEASE OF LIENS: The Contractor shall at time of final payment, submit signed copies of the "Release of Liens" as directed in the specifications and herein attached.
29. COUNTY/VENDOR RELATIONSHIP: The entering into of a Agreement between Contractor and the Board does not create an employer-employee relationship. Contractor shall at all times be treated as an independent contractor. Neither Contractor nor its employees, agents, subcontractors, subcontractor-employees, assignees, invitees or designees shall be considered employees of the Board, and shall not have any legal rights of a County employee.
30. Uniformed Law Enforcement Officers: Per N.J.S.A 40A:11-23.1 Uniformed Law Enforcement Officers are NOT required for this project.
31. All business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of \$50,000 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532.
32. Pursuant to N.J.A.C. 17:44-2.2, relevant records of private vendors or other persons entering into contracts with covered entities such as Burlington County are subject to audit or review by the New Jersey Office of the State Comptroller pursuant to N.J.S.A. 52:15C-14(d).

In addition, pursuant to N.J.A.C. 17:44-2.2(b), the contract vendor on this project shall maintain all documentation related to products, transaction or services under this contract for a period of five years from the date of final payment. Such record shall be made available to the New Jersey Office of the State Comptroller upon request.

33. Pursuant to N.J.S.A. 54:49-4.2, a business organization that fails to provide a copy of a business registration as required pursuant to N.J.S.A. 52:32-44, or subsection (e) or (f) of N.J.S.A. 5:12-92, or that provides false information of business registration under the requirements of either of those sections, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000.00 for each business registration copy not provided under a contract with a contracting agency or under a casino service industry enterprise contract.
34. Pursuant to N.J.S.A. 10:2-1,
 - 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.

35. Pursuant to N.J.S.A. 19:44A-20.27:

a. Any business entity making a contribution of money or any other thing of value, including an in-kind contribution, or pledge to make a contribution of any kind to a candidate for or the holder of any public office having ultimate responsibility for the awarding of public contracts, or to a political committee or continuing political committee, which has received in any calendar year \$50,000 or more in the aggregate through agreements or contracts with a public entity, shall file an annual disclosure statement with the New Jersey Election Law Enforcement Commission, established pursuant to section 5 of P.L.1973, c.83 (C.19:44A-5), setting forth all such contributions made by the business entity during the 12 months prior to the reporting deadline.

b. The commission shall prescribe forms and procedures for the reporting required in subsection a. of this section which shall include, but not be limited to:

- (1) the name and mailing address of the business entity making the contribution, and the amount contributed during the 12 months prior to the reporting deadline;
- (2) the name of the candidate for or the holder of any public office having ultimate responsibility for the awarding of public contracts, candidate committee, joint candidates committee, political committee or continuing political committee receiving the contribution; and
- (3) the amount of money the business entity received from the public entity through contract or agreement, the dates, and information identifying each contract or agreement and describing the goods, services or equipment provided or property sold.

c. The commission shall maintain a list of such reports for public inspection both at its office and through its Internet site.

d. When a 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. When a business entity is other than a natural person, a contribution by any person or other business entity having an interest therein shall be deemed to be a contribution by the business entity. When a business entity is other than a natural person, a contribution by: all principals, partners, officers, or directors of the business entity, or their spouses; any subsidiaries directly or indirectly controlled by the business entity; or any political organization organized under section 527 of the Internal Revenue Code that is directly or indirectly controlled by the business entity, other than a candidate committee, election fund, or political party committee, shall be deemed to be a contribution by the business entity.

As used in this section:

“business entity” means a for-profit entity that is a natural or legal person, business corporation, professional services corporation, limited liability company, partnership, limited partnership, business trust, association or any other legal commercial entity organized under the laws of this State or of any other state or foreign jurisdiction; and

“interest” means the 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, as appropriate.

e. Any business entity that fails to comply with the provisions of this section shall be subject to a fine imposed by the New Jersey Election Law Enforcement Commission in an amount to be determined by the commission which may be based upon the amount that the business entity failed to report.

36. Pursuant to (N.J.S.A. 40A:11-2.4(h)), This contract is subject to the availability and appropriation of funds.
37. NJ ONE CALL REQUIREMENTS: By submitting a bid, the contractor declares that they and their subcontractor(s) are aware of and, if required, will comply with the requirements of the "Underground Facility Protection Act (Public Law 1994, Chapter 118)" prior to commencing any intended excavation. The telephone number to call is 1-800-272-1000.
38. STATEMENT OF OWNERSHIP DISCLOSURE: 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, 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 stockholder 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 U.S. 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 U.S. 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 Attorney General has advised that the provisions of N.J.S.A. 52:25-24.2 et seq. which refer to corporations and partnerships apply to limited partnerships, limited liability partnerships, and Subchapter S. corporations.

The Statement of Ownership Disclosure form shall be completed under the "Attributes" tab located on the County's electronic procurement platform located at <https://burlcobids.ionwave.net>. Failure of the bidder to submit the required information is cause for automatic rejection of the bid.

*****END OF SECTION 00100 - INSTRUCTIONS TO BIDDERS*****

SECTION 00300

BURLINGTON COUNTY GENERAL CONDITIONS

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter 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 Design Professional. The Contract Documents also include all documents submitted as part of a complete bid submission or required to be submitted as a prerequisite for commencement of the work.

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 Modification as defined in 1.1.1 above. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Design Professional and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Design Professional or (4) between any persons or entities other than the Owner and Contractor. The Design Professional shall, however, be entitled to performance and enforcement of the obligations under the Contract intended to facilitate performance of the Design Professionals duties.

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, incidentals, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or part of the Project. Temporary facilities, tools, and other portions of the work which are not to be delivered to the Owner at, or prior to, final completion shall not be subject to the General Conditions except to the extent that they may interfere with or otherwise adversely affect the Owner's use of or interest in the site.

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 or 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.

1.1.6 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 inclusive of Division 0.

1.1.7 THE PROJECT MANUAL

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications,

1.1.8 THE OWNER

The term "Owner" means the Board of Commissioners of Burlington County, New Jersey

1.1.9 THE OWNER'S REPRESENTATIVE

For the purposes of this specification, the Owner's representative shall also be referred to as "Design Professional". The name of the Owner's representative is listed in Division 0, Section 00050.

1.1.10 CONTRACTOR

The word 'Contractor' shall mean the Contractor with whom the overall single lump-sum contract has been executed.

1.1.11 DESIGN PROFESSIONAL

The phrase 'Design Professional' shall reference the Architect or Engineer of Record for the Project.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1 The intent of the Contract Documents is to 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 to produce the indicated results. The terms "reasonably inferable" includes work necessary to "provide" work indicated or specified, as defined in the Contract Documents.

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

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

1.2.4 Details referenced to portions of the Work shall apply to other like portions of the Work not otherwise detailed.

1.2.5 The Contractor shall request, from the Design Professional, interpretation of apparent discrepancies, conflicts, or omissions in the Specifications and Drawings. Subcontractors shall forward such requests through the Contractor. Such requests, and the Design Professional interpretation, shall be in written form. Other forms of communications shall be used to expedite resolution of concerns, but will not be binding.

1.2.6 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 Design Professional will interpret the intent of the Drawings and Specifications; and the Contractor hereby agrees to abide by the Design Professional's interpretation and to carry out the work in accordance with the decision of the Design Professional. It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Design Professional 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.

1.2.7 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 Design Professional for adjustment, as the Contractor will be responsible for the fit or work in place.

1.2.8 When a profile, section or other finished condition is shown, furring or other method of obtaining such finished conditions shall be provided. The Drawings may show work fully drawn out or only a portion thereof, the remainder being in outline. The drawn out portions apply to other like or similar places.

1.2.9 Where it is required in the sSpecifications that materials, products, processes, equipment, or the like be installed or applied in accordance with manufacturer's 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. Provide copies of such instructions to the Design Professional and obtain his written approval before beginning Work.

1.2.10 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 adopted revision thereof and any amendments or supplements thereto in effect at the time the Contract Documents are issued for bid. The standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in the Specifications. The Design Professional will furnish upon request information as to how copies of the standards referred to may be obtained.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Design Professionals.

1.4 INTERPRETATION

1.4.1 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 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Owner and the Contractor shall sign five (5) copies of the Contract Documents. One (1) complete set will be returned to the Contractor and shall serve as his copy of the executed Contract for Construction.

1.5.2 Execution of the Contract by the Contractor is a representation that the Contractor may have visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings and Specifications prepared by the Design Professional and the Design Professional's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. Other documents, including those in electronic format are not included in the Instruments of Service. The Contractor will be issued free of charge one paper copy of the plans and one copy of the Specifications for his use during the Project. Neither the Contractor nor any Subcontractor, Sub-subcontractors or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Design Professional or the Design Professional's consultants, and unless otherwise indicated the Design Professional and the Design Professional's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, shall be returned or suitably accounted for to the Design Professional, at the Owner's and or the Design Professional's request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Design Professional and the Design Professional's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project, they are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the Scope of the Work without the specific written consent of the Owner, Design Professional and the Design Professional's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Design Professional and the Design Professional's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorizations shall bear the statutory copyright

notice, if any, shown on the Drawings, Specifications and other documents prepared by the Design Professional and the Design Professional's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Design Professional's or Design Professional's consultants' copyrights or other reserved rights.

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 Subparagraph 4.2.1, the Design Professional 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 (15) 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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.2. The Contractor shall secure and pay for all necessary approvals from any agency with jurisdiction over the work, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. The Owner shall reimburse the Contractor for the direct cost of such expenses, without mark-up for overhead and profit pursuant to Subparagraph 7.2.1.

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and legal description of the site. The Contractor shall not be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.2.5 The Contractor will be furnished free of charge: One (1) set of Contract Documents fully executed by Contractor and Owner, and sealed Drawings and Specifications as required for submission to necessary code officials, one (1) set of reproducible Drawings and one (1) additional Project Manual for use by the Contractor and the subcontractors to make record documents. If additional documents are required by the Contractor, the additional documents may be obtained at the cost of reproduction. One (1) copy of any subsequent Drawing issued after the release of the bid documents will be provided free of charge.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with 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, except to the extent required by Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven (7) day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change order shall be issued deducting from payments then or thereafter due the Contractor for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Design Professional's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Design Professional. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor and/or his Surety shall pay the difference to the Owner.

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 term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents

3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Design Professional in the Design Professional's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Design Professional at once.

The Contractor agrees that he will make no claim for additional payment or any other concession because of any misinterpretation or misunderstanding of the Contract Documents on his part, or of any failure to fully familiarize himself with any conditions related to the contract. This does not

preclude the contractor from claiming additional payment related to differing site conditions pursuant to NJSA 40A:11-16.7 as listed below

Differing Site Conditions:

(1) If the contractor encounters differing site conditions during the progress of the work of the contract, the contractor shall promptly notify the contracting unit in writing of the specific differing site conditions encountered before the site is further disturbed and before any additional work is performed in the impacted area.

(2) Upon receipt of a differing site conditions notice in accordance with paragraph (1) of this subsection, or upon the contracting unit otherwise learning of differing site conditions, the contracting unit shall promptly undertake an investigation to determine whether differing site conditions are present.

(3) If the contracting unit determines different site conditions that may result in additional costs or delays exist, the contracting unit shall provide prompt written notice to the contractor containing directions on how to proceed.

(4)

(a) The contracting unit shall make a fair and equitable adjustment to the contract price and contract completion date for increased costs and delays resulting from the agreed upon differing site conditions encountered by the contractor.

(b) If both parties agree that the contracting unit's investigation and directions decrease the contractor's costs or time of performance, the contracting unit shall be entitled to a fair and equitable downward adjustment of the contract price or time of performance.

(c) If the contracting unit determines that there are no differing site conditions present that would result in additional costs or delays, the contracting unit shall so advise the contractor, in writing, and the contractor shall resume performance of the contract, and shall be entitled to pursue a differing site conditions claim against the contracting unit for additional compensation or time attributable to the alleged differing site conditions.

(5) Execution of the contract by the contractor shall constitute a representation that the contractor has visited the site and has become generally familiar with the local conditions under which the work is to be performed.

(6) As used in this subsection, "differing site conditions" mean physical conditions at the contract work site that are subsurface or otherwise concealed and which differ materially from those indicated in the contract documents or are of such an unusual nature that the conditions differ materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the contract.

Suspension of Work:

(1) The contracting unit shall provide written notice to the contractor in advance of any suspension of work lasting more than 10 calendar days of the performance of all or any portion of the work of the contract.

(2) If the performance of all or any portion of the work of the contract is suspended by the contracting unit for more than 10 calendar days due to no fault of the contractor or as a consequence of an occurrence beyond the contracting unit's control, the contractor shall be entitled to compensation for any resultant delay to the project completion or additional contractor expenses, and to an extension of time, provided that, to the extent feasible, the contractor, within 10 calendar days following the conclusion of the suspension, notifies the contracting unit, in writing, of the nature and extent of the suspension of work. The notice shall include available supporting information, which information may thereafter be supplemented by the contractor as needed and as may be reasonably requested by the contracting unit. Whenever a work suspension exceeds 60 days, upon seven days' written notice, either party shall have the option to terminate the contract for cause and to be fairly and equitably compensated therefor.

(3) Upon receipt of the contractor's suspension of work notice in accordance with paragraph (2) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(4)

(a) If the contracting unit determines that the contractor is entitled to additional compensation or time, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall proceed with the performance of the contract work, and shall be entitled to pursue a suspension of work claim against the contracting unit for additional compensation or time attributable to the suspension.

(5) Failure of the contractor to provide timely notice of a suspension of work shall result in a waiver of a claim if the contracting unit can prove by clear and convincing evidence that the lack of notice or delayed notice by the contractor actually prejudiced the contracting unit's ability to adequately investigate and defend against the claim.

Change in Character of Work:

(1) If the contractor believes that a change directive by the contracting unit results in a material change to the contract work, the contractor shall so notify the contracting unit in writing. The contractor shall continue to perform all work on the project that is not the subject of the notice.

(2) Upon receipt of the contractor's change in character notice in accordance with paragraph (1) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(3)

(a) If the contracting unit determines that a change to the contractor's work caused or directed by the contracting unit materially changes the character of any aspect of the contract work, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date. The basis for any such price adjustment shall be the difference between the cost of performance of the work as planned at the time of contracting and the actual cost of such work as a result of its change in character, or as otherwise mutually agreed upon by the contractor and the contracting unit prior to the contractor performing the subject work.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall continue the performance of all contract work, and shall be entitled to pursue a claim against the contracting unit for additional compensation or time attributable to the alleged material change.

(4) As used in this subsection, "material change" means a character change which increases or decreases the contractor's cost of performing the work, increases or decreases the amount of time by which the contractor completes the work in relation to the contractually required completion date, or both.

Change in Contract Quantities:

(1) The contracting unit may increase or decrease the quantity of work to be performed by the contractor.

(2)

(a) If the quantity of a pay item is cumulatively increased or decreased by 20 percent or less from the bid proposal quantity, the quantity change shall be considered a minor change in quantity.

(b) If the quantity of a pay item is increased or decreased by more than 20 percent from the bid proposal quantity, the quantity change shall be considered a major change in quantity.

(3) For any minor change in quantity, the contracting unit shall make payment for the quantity of the pay item performed at the bid price for the pay item.

(4)

(a) For a major increase in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity in excess of 120 percent of the bid proposal quantity. If a mutual agreement cannot be reached on a negotiated price for a major quantity increase, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid.

(b) For a major decrease in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity of work performed. If a mutual agreement cannot be reached on a negotiated price for a major quantity decrease, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid; provided, however, that the contracting unit shall not make a payment in an amount that exceeds 80 percent of the value of the bid price multiplied by the bid proposal quantity.

If the Contractor performs any construction activity knowing or having a reasonable opportunity to know that it involves a recognized or apparent error, inconsistency or omission in the Contract Documents without such written notice to the Design Professional, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Design Professional, but 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.

3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Design Professionals in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraph 3.2.1. and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall be fully and 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 written notice to the Owner and Design Professional and shall not proceed with that portion of the Work without further written instructions from the Design Professional.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor of 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 shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Design Professional in the Design Professional's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.3.4.1 Contractor shall lay out work and be responsible for all lines, elevations and measurements of the building, and other work executed by him under the Contract. They must exercise proper

precaution to verify the figures shown on the drawings before laying out the work and will be held responsible for any errors resulting from their failure to exercise such precaution.

3.3.5 The Contractor, when requested by the Design Professional, shall meet with representative of the Design Professional at all times and furnish all information requested. They shall allow the Design Professional to inspect the work at all times. Neither the Owner nor the Design Professional 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 Design Professional done in good faith and within the scope of their employment by the Owner. In addition, the Contractor is entrusted with the oversight, management control and general direction of this project to insure that all contract completion dates are met. In the event that there are any delays caused to any subcontractor on this project, liability shall lie with the Contractor and not with the Owner.

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 the 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.

3.4.1.1 The Contractor must provide, at his own expense, suitable storage facilities at the site for the proper protection and safe storage of his materials. Such storage facilities and placement thereof must be approved in advance in writing by the Design Professional or Owners Representative.

3.4.1.2 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 Design Professional's consent, but the Contractor shall remove all surplus materials upon completion of each phase of the work and as directed by the Design Professional or Owners Representative.

3.4.1.3 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 held responsible for any repairs, patching or cleaning arising from such use. Prior approval of Design Professional and Owner for use of such areas is mandatory.

3.4.2 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the design professional and in accordance with an RFI and associated Change Order if applicable.

3.4.2.1 Not later than twenty (20) days from the Notice to Proceed, 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 Div. 1-26, and if applicable, the installing Subcontractor's name. If a proposed product is being submitted as a proposed "equal" and not listed in the Specifications, comply with requirements listed elsewhere in the Specifications.

3.4.2.2 The Design Professional will promptly reply in writing to the Contractor stating whether the Owner or the Design Professional, after due investigation, has reasonable objection to any such "or equal" proposal. If adequate data on any proposed manufacturer or installer is not available, the Design Professional may State that action will be deferred until the Contractor provides further data.

Failure of the Owner or the Design Professional to reply promptly shall not constitute a waiver of any of the requirement of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements. Any changes to such an approved list will be deemed a substitution.

3.4.2.3 After the Contract has been executed, the Owner and the Design Professional will consider a formal request for the substitution of products in place of those specified only under the conditions set forth elsewhere in the Specifications. By making requests for substitutions the Contractor:

- (A) Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
- (B) Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified.
- (C) Certifies that the cost data presented is complete and includes all related costs under this Contract but excludes costs under separate contracts, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
- (D) Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

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

3.4.4 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.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Design Professional that materials and equipment furnished under the contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirement of the Contract.

3.5.2 The warranty period for the Work shall be two (2) years from the date of Final Acceptance or the Certificate of Occupancy, whichever occurs later. The Contractor shall be responsible for work or materials provided by the Suppliers, Subcontractors or others during this warranty period.

3.5.3 The Contractor shall provide a maintenance bond during the warranty period in accordance with the requirements outlined in Article 11 INSURANCE AND BONDS of the Supplementary General Conditions.

3.5.3 The Contractor shall maintain insurance coverage in accordance with the requirements for Liability Insurance/Maintenance Guarantee Period in Article 11 INSURANCE AND BONDS of the Supplementary General Conditions

3.6 TAXES

3.6.1 The County of Burlington is exempt from all taxes including Federal Excise Tax, Fuel Tax, Transportation Taxes, and State Sales or Use Tax. Contractor's Exemption Purchase Certificate Form ST-13, issued by the State of New Jersey, Division of Taxation, Sales Tax Bureau, shall be completed and submitted to his suppliers for materials used on this project only.

3.7 PERMITS, FEES AND NOTICES

3.7.1 The Contractor shall secure and pay for all fees for permits from agencies with jurisdiction, certificates and inspections in connection with the project and shall be responsible for the associated coordination with appropriate trades and officials. The Owner shall reimburse the Contractor for direct fees associated with municipal and state fees without markup for overhead and profit pursuant to subparagraph 7.2.1.

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

3.7.2.1 The Contractor shall be responsible to obtain and maintain business licenses required by the State, county and / or city 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.

3.7.3 The Contractor is responsible to insure that his Work as described by the Contract Documents is in accordance with applicable laws, statutes ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Design Professional and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.3 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Design Professional and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

3.8 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. The Design Professional shall review for approval all allowance items and the costs of such items as submitted by the contractor.

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, all required taxes, less applicable trade discounts; costs for unloading and handling at the site, labor, and installation costs.

2. Contractor's overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;
3. whenever costs are more or less than allowances, the contract sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect:
 - a. The difference between actual costs and the allowances under Clause 3.8.2.1 and
 - b. Changes in Contractor's costs under Clause 3.8.2.2

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay the Work.

3.9 PROJECT MANAGER AND SUPERINTENDENT

3.9.1 The Contractor shall employ and assign a competent project manager to the Project.

3.9.2 At least one Superintendent shall be required at each project site and shall be present at the jobsite from the start of construction and shall remain on the site until the completion of all corrective and punch list items. The number of necessary assistants to the Superintendent shall be such that areas where work is in progress shall be adequately supervised by the Contractors Superintendent or one of his assistants. If, in the Design Professionals' opinion, the quality or progress of the Work is adversely affected by lack of adequate supervision, the Contractor shall increase the number of supervisory personnel at no increase in the Contract Sum.

3.9.2.1 The Superintendent shall be "full time" and present at the site for the duration of the entire Project while the Work is progressing.

3.9.3 The Project Manager and the Superintendent cannot be the same person.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Design Professional's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised monthly and included with each monthly payment application.

3.10.1.1 Less specified elsewhere the Contractor shall comply with these requirements: Within fifteen (15) days after the date of the "Notice to Proceed " the General Contractor shall submit to the Design Professional, on forms supplied by the Design Professional, or on the Contractor's own forms if acceptable to the Design Professional, a bar-graph Progress Schedule upon which shall be indicated the dates for starting and the dates for completion of all Contracts and all divisions of the work in a manner which will coincide with Time for Completion. Progress Schedules should be updated and presented at each construction meeting unless otherwise noted.

3.10.2 The Contractor shall prepare and keep current, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Design Professional reasonable time to review submittals.

3.10.3 The Contractor shall perform the Work in accordance with the most recent approved schedules submitted to the Owner and Design Professional.

3.10.4 Schedules shall comply with the requirements of Division 1 relating to "Construction Schedules."

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes redlined and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be available to the Design Professional and shall be delivered to the Design Professional for submittal to the Owner upon completion of the Work.

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-subcontractors, manufacturers, supplier, or distributor to illustrate specific 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 which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged except for samples authorized to be used in the Work, samples shall be delivered to the Design Professional upon completion of the Work if requested, and otherwise shall become the property of the Contractor and shall be removed from the site.

3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given at the design concept expressed in the Contract Documents. Review by the Design Professional is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Design Professional is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Design Professional without action.

3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Design Professional Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents. This shall be done with reasonable promptness and in each 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 Design Professional without action.

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field

measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements for 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 reviewed by the Design Professional.

3.12.8 The Work shall be in accordance with reviewed submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Design Professional's review of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Design Professional in writing of such deviation at the time of submittal and (1) the Design Professional 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 Design Professional's review 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 Design Professional on previous submittals. In absence of such written notice the Design Professional's approval thereof.

3.12.10 The Contractor shall not be required to provide professional services which 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. 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 Design Professional will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly 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, if prepared by others, shall bear such professional's written approval when submitted to the Design Professional, the Owner and the Design Professional shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Design Professional have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Design Professional will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with the information given the design concept expressed in the Contract Documents the Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

3.12.11 Detailed requirements for Shop Drawings, Product Data and Samples are specified in Division 1.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not encumber the site.

3.13.2 The Contractor is responsible for insuring the safety of the Work and all persons associated with the work either directly or indirectly through the location and weights of all equipment and materials he intends to place on the slab.

3.13.3 If not specified in the Contract Documents, the limit of Contractor activities and use of the site shall be determined by the Design Professional prior to the start of construction.

3.14 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.

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 such construction by the Owner of a separate contractor except with written consent of the Owner and of such separate contractor, such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the owner or a separate contractor the Contractor's 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 or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 The Contractor shall be responsible to clean the site at the end of each work day.

3.15.3 The Contractor shall be responsible to supply separate dumpsters for general refuse, wood, cardboard, and other recyclable materials as the contract warrants to reduce the impact of the job on landfills and create overall less waste.

3.15.4 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Design Professional access to the Work in preparation and progress wherever located. Access shall be permitted at all times.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 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 Design Professional harmless from loss on account thereof, but shall not be responsible for such 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 Design Professional. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Design Professional.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law and to the extent claims, damages, losses or expenses are not covered by Article 11 the Contractor shall indemnify and hold harmless the Owner, Design Professional, Design Professional's consultants, and agents and employees of any of them from and against claims, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone whose acts they may be liable, the indemnification obligation under Subparagraph 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 Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

3.18.3 The Contractor's indemnification as described in Section 3.18 shall continue after the completion of the performance of the Work for any claim, damage, loss or expense caused by negligent acts or omissions of the Contractor, a Subcontractor or anyone for whose acts they may be responsible which negligent acts or omissions occur prior to the completion of the Work or the Maintenance Guarantee Period.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

4.1 DESIGN PROFESSIONAL

4.1.1 The Design Professional is the person lawfully licensed to practice or an entity lawfully practicing identified as such in the Agreement and is referred to throughout the Contract

Documents as if singular in number. The term "Design Professional" means the Design Professional or the Design Professional's authorized representative." The term Design Professional includes the Design Professional or other professional listed elsewhere in the Contract Documents as the Owner's Representative.

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

4.1.3 If the employment of the Design Professional is terminated, the Owner shall employ a new Design Professional whose status under the Contract Documents shall be that of the former Design Professional.

4.2 DESIGN PROFESSIONALS ADMINISTRATION OF THE CONTRACT

4.2.1 The Design Professional will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the two-year maintenance period for correction of Work described in Paragraph 12.2. The Design Professional 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 Design Professional, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Design Professional will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work, The Design Professional will neither have control over or charge of, nor be responsible 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, except as provided in Subparagraph 3.3.1.

4.2.3 The Design Professional will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Design Professional 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 Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Design Professional about matters arising out of or relating to the Contract. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Design Professional.

4.2.5 Based on the Design Professional's evaluation of the Contractor's Applications for Payment, the Design Professional will review and certify the amount due and issue Certificates for Payment in accordance with Article 9.

4.2.6 The Design Professional will have authority to reject Work that does not conform to the Contract Documents. Whenever the Design Professional Considers it necessary or advisable, the Design Professional will have authority to require inspections or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3 whether or not such Work is fabricated, installed or compiled. However, neither this authority of the Design Professional 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 Design Professional to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

4.2.7 The Design Professional will ~~take~~ appropriate action upon the Contractor's submittals such as Shop Drawing, 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 Design Professional's actions will be taken in accordance with the accepted Submittals Schedule, while allowing sufficient time in the Design Professional'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 Design Professional's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Design Professional's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Design Professional, of any construction means, methods, techniques, sequences or procedures. The Design Professional's review of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Design Professional will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Article 7 CHANGES IN WORK.

4.2.9 The Design Professional will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner, for the Owners review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Design Professional agree, the Design Professional will provide one or more project representatives to assist in carrying out the Design Professionals' responsibilities at the site. The duties, responsibilities, and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.2.11 The Design Professional will interpret and decide matters concerning performance under and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Design Professional's response to such request will be made in writing. delay shall not be recognized on account of failure by the Design Professional to furnish such interpretations.

4.2.12 Interpretations and decisions of the Design Professional 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. When making such interpretations and initial decisions, the Design Professional will endeavor to secure faithful performance by both Owner and Contractor will not show partiality to either and will not be liable for results of interpretations or decisions do rendered in good faith.

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

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of 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. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. Claims by the Contractor must be initiated within five (5) days after occurrence of the event giving rise to such Claim or within five (5) days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Design Professional and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in 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.

4.3.4 Claims for Concealed or Unknown Conditions.

(1) If the contractor encounters differing site conditions during the progress of the work of the contract, the contractor shall promptly notify the contracting unit in writing of the specific differing site conditions encountered before the site is further disturbed and before any additional work is performed in the impacted area.

(2) Upon receipt of a differing site conditions notice in accordance with paragraph (1) of this subsection, or upon the contracting unit otherwise learning of differing site conditions, the contracting unit shall promptly undertake an investigation to determine whether differing site conditions are present.

(3) If the contracting unit determines different site conditions that may result in additional costs or delays exist, the contracting unit shall provide prompt written notice to the contractor containing directions on how to proceed.

(4)

(a) The contracting unit shall make a fair and equitable adjustment to the contract price and contract completion date for increased costs and delays resulting from the agreed upon differing site conditions encountered by the contractor.

(b) If both parties agree that the contracting unit's investigation and directions decrease the contractor's costs or time of performance, the contracting unit shall be

entitled to a fair and equitable downward adjustment of the contract price or time of performance.

(c) If the contracting unit determines that there are no differing site conditions present that would result in additional costs or delays, the contracting unit shall so advise the contractor, in writing, and the contractor shall resume performance of the contract, and shall be entitled to pursue a differing site conditions claim against the contracting unit for additional compensation or time attributable to the alleged differing site conditions.

(5) Execution of the contract by the contractor shall constitute a representation that the contractor has visited the site and has become generally familiar with the local conditions under which the work is to be performed.

(6) As used in this subsection, "differing site conditions" mean physical conditions at the contract work site that are subsurface or otherwise concealed and which differ materially from those indicated in the contract documents or are of such an unusual nature that the conditions differ materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the contract.

Suspension of Work:

(1) The contracting unit shall provide written notice to the contractor in advance of any suspension of work lasting more than 10 calendar days of the performance of all or any portion of the work of the contract.

(2) If the performance of all or any portion of the work of the contract is suspended by the contracting unit for more than 10 calendar days due to no fault of the contractor or as a consequence of an occurrence beyond the contracting unit's control, the contractor shall be entitled to compensation for any resultant delay to the project completion or additional contractor expenses, and to an extension of time, provided that, to the extent feasible, the contractor, within 10 calendar days following the conclusion of the suspension, notifies the contracting unit, in writing, of the nature and extent of the suspension of work. The notice shall include available supporting information, which information may thereafter be supplemented by the contractor as needed and as may be reasonably requested by the contracting unit. Whenever a work suspension exceeds 60 days, upon seven days' written notice, either party shall have the option to terminate the contract for cause and to be fairly and equitably compensated therefor.

(3) Upon receipt of the contractor's suspension of work notice in accordance with paragraph (2) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(4)

(a) If the contracting unit determines that the contractor is entitled to additional compensation or time, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall proceed with the performance of the

contract work, and shall be entitled to pursue a suspension of work claim against the contracting unit for additional compensation or time attributable to the suspension.

(5) Failure of the contractor to provide timely notice of a suspension of work shall result in a waiver of a claim if the contracting unit can prove by clear and convincing evidence that the lack of notice or delayed notice by the contractor actually prejudiced the contracting unit's ability to adequately investigate and defend against the claim.

Change in Character of Work:

(1) If the contractor believes that a change directive by the contracting unit results in a material change to the contract work, the contractor shall so notify the contracting unit in writing. The contractor shall continue to perform all work on the project that is not the subject of the notice.

(2) Upon receipt of the contractor's change in character notice in accordance with paragraph (1) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(3)

(a) If the contracting unit determines that a change to the contractor's work caused or directed by the contracting unit materially changes the character of any aspect of the contract work, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date. The basis for any such price adjustment shall be the difference between the cost of performance of the work as planned at the time of contracting and the actual cost of such work as a result of its change in character, or as otherwise mutually agreed upon by the contractor and the contracting unit prior to the contractor performing the subject work.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall continue the performance of all contract work, and shall be entitled to pursue a claim against the contracting unit for additional compensation or time attributable to the alleged material change.

(4) As used in this subsection, "material change" means a character change which increases or decreases the contractor's cost of performing the work, increases or decreases the amount of time by which the contractor completes the work in relation to the contractually required completion date, or both.

Change in Contract Quantities:

(1) The contracting unit may increase or decrease the quantity of work to be performed by the contractor.

(2)

(a) If the quantity of a pay item is cumulatively increased or decreased by 20 percent or less from the bid proposal quantity, the quantity change shall be considered a minor change in quantity.

(b) If the quantity of a pay item is increased or decreased by more than 20 percent from the bid proposal quantity, the quantity change shall be considered a major change in quantity.

(3) For any minor change in quantity, the contracting unit shall make payment for the quantity of the pay item performed at the bid price for the pay item.

(4)

(a) For a major increase in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity in excess of 120 percent of the bid proposal quantity. If a mutual agreement cannot be reached on a negotiated price for a major quantity increase, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid.

(b) For a major decrease in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity of work performed. If a mutual agreement cannot be reached on a negotiated price for a major quantity decrease, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid; provided, however, that the contracting unit shall not make a payment in an amount that exceeds 80 percent of the value of the bid price multiplied by the bid proposal quantity.

(5) As used in this subsection, the term "bid proposal quantity" means the quantity indicated in the bid proposal less the quantities designated in the project plans as "if and where directed."

4.3.5 If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6. All required notices for additional costs shall be made by certified mail.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Design Professional, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Design Professional, (4) termination of the Contract by the Owner, (5) Owner's suspension or (6) other reasonable grounds, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 Claim for Additional Time

4.3.7.1 All claims for additional time shall comply with N.J.A.C. 5:30-11.3.

(a) No changes in quantities, work performed, services rendered, materials, supplies or equipment delivered or provided shall be authorized, permitted or accepted except by the procedures established herein.

All change orders unless otherwise stated in this subchapter shall be subject to the following:

1. Each change order shall be in writing and shall be numbered consecutively (beginning with number one) and attached to the original purchase order or contract for each project.

2. Change orders which result in payment reduction below the originally contracted price may be made by locally established procedure, provided that any change orders increasing cost on the same contract shall include reference to such reductions.

3. Quantities of items or work shall not be changed in such a manner as to nullify the effect of the competitive determination of lowest responsible bidder which was made at the time of contract award, if at said time the changes could have been reasonably foreseen.

4. Responsibility required by these rules to be exercised specifically by the governing body, including authorization of change orders, shall not be delegated except for minor field (site) modifications pursuant to N.J.A.C. 5:30-11.4.

5. Change orders may be executed by the representative appointed by the governing body but the responsibility for the authorization of change orders shall not be delegated by the governing body except for minor field (site) modifications pursuant to N.J.A.C. 5:30-11.4.

6. Change orders shall be used to change the number of units or items originally advertised and contracted for, provided that: i. ii. iii. Unit prices or a price methodology were sought in the original specifications and included in the contract; The original specification and the contract included a provision that the unit prices could be so used; and If (a)6i and ii above were not contained in the original specification, a change order shall not be issued.

7. Change orders shall not be used to substantially change the quality or character of the items or work to be provided, inasmuch as such would have been a determining factor in the original bidding.

8. Change orders shall not serve the purpose of escalation clauses and, therefore, shall not be utilized to effectuate upward price adjustments.

9. Total number of change orders executed for a particular contract shall not cause the originally awarded contract price to be exceeded by more than 20 percent unless otherwise authorized by these rules.

10. If proposed change orders do exceed the 20 percent limitation of (a)9 above, no work shall be performed or purchases made until the procedures of N.J.A.C. 5:30-11.9 have been completed. If the governing body determines issuance of the change order is not justifiable, a new contract shall be executed in accordance with the Local Public Contracts Law.

11. Before authorizing any change orders resulting in additional expenditures, the availability of funds shall be certified in writing by the chief financial officer or certifying finance officer, as appropriate.

12. The 20 percent limitation of (a)9 above shall not apply to emergency situations as defined within N.J.S.A. 40A:11-6.

13. Change order authorizations shall not be withheld until the completion of the entire project.

If the Contractor wishes to make Claim for an increase in the Contract Time, written notices provided herein shall be given. The Contractor's Claim shall include an estimate of probable effect on progress of the Work. In the case of a continuing delay only one Claim is necessary. Claims for additional time shall not include reimbursement to the Contractor for any additional money. All required notices for additional time shall be made by certified mail.

4.3.7.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could have been reasonably anticipated, and had an adverse effect on the scheduled construction.

4.3.7.3 Any claim for extension of time should be made in writing to the Design Professional not more than five (5) days after the commencement of any delay, 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.

4.3.8 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 estimate not exceeding twenty one (21) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

4.3.9 If unit prices are stated in the Contract Documents and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive or if stated prices cannot be justified by the Design Professional so that application of such unit prices to revised quantities of Work proposed will cause substantial inequity to the Owner, the applicable unit prices shall be equitably adjusted.

4.3.10 The Contractor agrees that if any delay in the Contractor's works unnecessarily delays the work of any Contractor or Contractors; or causes the Owner or the Owner's vendors damages for expenses that the Owner or his vendors would not have needed to incur; 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 monies due or to become due the Contractor under this Contract. The Design Professional shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor or for causing such damages to be incurred. His decision shall be final.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Design Professional. Claims, including those alleging an error or omission by the Design Professional but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Design Professional for decision. An initial decision by the Design Professional shall be required as a condition precedent to mediation, or litigation of all Claims between the Contractor and the Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Design Professional with no decision having been rendered by the Design Professional. The Design Professional will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Design Professional will review Claims and within ten (10) days of the receipt of Claim take one of 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 on part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Design Professional is unable to resolve this claim. If the Design Professional lacks sufficient information to evaluate the merits of the claim or if the Design Professional concludes that, in the Design Professional's sole discretion, it would be inappropriate for the Design Professional to resolve the claim.

4.4.3 In evaluating Claims, the Design Professional 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 Design Professional in rendering a decision. The Design Professional may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Design Professional 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 such request, and shall either provide a response on the requested supporting data, advise the Design Professional when the response of supporting data will be furnished or advise the Design Professional that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Design Professional will either reject or approve the Claim in whole or in part.

4.4.5 The Design Professional will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Design Professional shall be final and binding on the parties but subject to mediation.

4.4.6 When a written decision of the Design Professional states that (1) the decision is final but subject to mediation and (2) a demand for mediation of a Claim covered by such decision must be made within thirty (30) days after the date on which the party making the demand received the final written decision, then failure to demand mediation within said thirty (30) days' period shall result in the Design Professional's decision becoming final and binding upon the Owner and Contractor. If the Design Professional renders a decision after mediation proceedings have been initiated, such decision may be entered as evidence, but shall not supersede mediation proceedings unless the decision is acceptable to all parties

4.4.7 Upon receipt of Claim against the Contractor or at any time thereafter, the Design Professional or the Owner 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 Design Professional or Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 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 Design Professional, by mediation.

4.5 MEDIATION

4.5.1 Pursuant to the requirements of N.J.S.A. 40A:11-50, any Claim arising out of or related to the

Contract, except Claims relating to the aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Design Professional or 30 days after submission of the Claim to the Design Professional, be subject to alternative dispute resolution through mediation as a condition precedent to the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3 The party seeking mediation shall pay the entire case filing or set-up fee to the American Arbitration Association. All other expenses shall be paid in accordance with M-17 of the AAA Construction Industry Mediation Rules. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.5.4 The Contractor must proceed with all work required under this Contract during the mediation process described below if so, required by the Board in its sole discretion.

4.5.5 A dispute arising under this Contract shall be submitted in writing to the County's representative with all facts and supporting data. The County's representative will submit the written description of the dispute to the County, who will review the dispute and issue its decision or request additional facts or documentation after which it will render a decision.

4.5.6 After receipt of the decision from the County, disputes shall be submitted for mediation to the American Arbitration Association (AAA) under the American Arbitration Association Construction Industry Mediation Rules prior to being submitted to a court for adjudication with the exception of disputes concerning the bid solicitation for award process or the formation of contracts or subcontracts entered into pursuant to the Local Public Contracts Law.

4.5.7 Whenever more than one dispute of a similar nature arises under a construction contract or under related construction contracts, a contracting party may demand that the disputes be joined unless the mediator appointed to resolve the dispute determines that the disputes are inappropriate for joinder.

4.5.8 Whenever a dispute concerns more than one contract, such as when a dispute in a contract involving construction relates to a contract involving design, architecture, engineering or management, upon the demand of a contracting party, the disputes shall be joined unless the mediator determines that the disputes are inappropriate for joinder.

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. 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 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 SUBCONTRACT

5.2.1 The names of all subcontracts not required to be supplied in the Bid Form and material suppliers shall be submitted to the Design Professional 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 Design Professional to determine general conformance to Contract requirements. Approval of the submittals required under this Article shall not relieve the Contractor from conformance to Contract requirements.

5.2.2 The Design Professional will promptly reply in writing to the Contractor stating whether the Owner or the Design Professional, after due investigation, has reasonable objection to any such proposed subcontractor, manufacturer, installer or material supplier. If adequate data on any such proposed entity is not available, the Design Professional may state that action will be deferred until the Contractor provides further data. Failure of the Owner or the Design Professional to reply promptly shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements.

5.2.3 If the Owner or Design Professional has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Design Professional has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such a change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such a change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Design Professional makes reasonable objection to such substitute.

5.2.5 If a Subcontractor is a manufacturer or supplier of products, or is otherwise limited as to the products he can supply, and if products to be installed by that Subcontractor require any specified procedures to determine compliance with requirements of the contract, then identification of such Subcontractor shall be considered tentative subject to determination of product compliance, and no Change Order shall be issued to the Contractor to replace such Subcontractor with a Subcontractor capable of complying with the requirements of the contract.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, 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 the terms of Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Design Professional. Each subcontract agreement shall preserve and protect the rights of the Owner and Design Professional under the Contract Documents with respect to the Work to be performed by 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 propped subcontract agreement which 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.

5.3.2 The Contractor shall obligate each subcontractor specifically to comply with the New Jersey Plan of Affirmative Action to avoid discriminatory practice in employment.

5.3.3 The Contractor shall obligate each subcontractor to comply with the applicable prevailing wage schedule of the Department of Labor of the State of New Jersey.

5.3.4 Written confirmation of award of each major subcontract, other than those required to be submitted with the Bid Submission shall be submitted to the Design Professional, in form subject to his approval, within seven (7) days after receipt of Design Professional's request.

5.4 RESERVED

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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. The Contractor shall coordinate and supervise such efforts in order to eliminate claims & damages.

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 provide for the coordination of the Work of his own forces and of each of the separate contractors. In addition, the Contractor shall insure the cooperation of his forces and those of his subcontractors as provided in Paragraph 6.2 with the forces of the Owner's staff, Contractors and/or Subcontractors.

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, the Owner shall be deemed to be subject to the same obligations and to have the same rights which to apply to the Contractor 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 of a separate contractor, the Contractor shall prior to proceeding with that portion of the Work, promptly report to the Design Professional apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgement that the Owner's or separate contractors completed or partially completed construction is fit and proper to receive the Contractors Work, except as to defects not then reasonably discoverable.

6.2.3 The Owner shall be reimbursed by the Contractor for costs incorrect by the Owner which are payable to a separate contractor because of delays, improperly timed activities, or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of the delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4 Should the Contractor cause damage to the work or property of any separate contractor or subcontractor on the project, the Contractor shall, upon due notice, promptly settle with such other contractor by agreement or otherwise resolve the dispute. If such separate contractor sues or institutes an arbitration proceeding against the Owner on account of any damage alleged to have been so sustained, the Contractor shall defend such proceeding at his own expense, and if any judgment against the Owner arises there from, the Contractor shall pay or satisfy it and shall reimburse the Owner for any attorney's fees and court costs which the Owner has incurred.

6.2.5 Should the Contractor cause damage to the work or property of any separate Contractor on the project, the contractor shall, upon due notice, settle with such other Contractor by agreement or Court of Law if he will so settle. If such separate Contractor sues the Owner or the Design Professional or initiates a Court of Law proceeding on account of any damage alleged to have been so sustained, the Contractor agrees that he will hold the Owner or Design Professionals harmless against any such claim or suite and that he will reimburse to the Owner or Design Professional as the case may be, the cost of defending such suit, including a reasonable attorney" fee and if any

judgment against the Owner or Design Professional arises there from, the Contractor shall pay all cost incurred by the Owner or Design Professional.

6.2.6 Should the Contractor be caused damage by any other separate Contractor on the Work by reason of such other 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 damages against such separate contractor as a third party beneficiary under the Contract between such other Contractor and the Owner.

6.2.7 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3

ARTICLE 7 CHANGES IN 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. All change orders shall be in accordance with N.J.A.C. 5:30-11.3.

7.1.2 A Change Order shall be upon agreement among the Owner, Contractor and Design Professional: a Construction Change Directive requires agreement by the Owner and Design Professional 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 Design Professional alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly unless other side 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 Design Professional and signed by the Owner, Contractor, and Design Professional, stating their agreement upon all of the following:

1. 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 for determining the change to the Contract Sum for Change Orders shall be the same as stated in Subparagraph 7.3 CONSTRUCTION CHANGE DIRECTIVES.

7.2.3 Any change in work authorized in writing by the Owner or Design Professional 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, equipment, and overhead and profit in accordance with Subparagraph 7.3.6 and 7.3.10.

7.2.4 When a Change Order involves both additions and deletions in material, the net quantity are to be determined and the allowable overhead and profit as defined in 7.3.10 is to be applied to the net quantity.

7.2.5 When a Change Order involves deletions in material and labor, the amount of the credit will be equal to the line item on the Schedule of Values or a unit of the value if only a portion of the value is being deleted.

7.2.6 EXTRA WORK: Any work which may be required of the Contractor and is not, in the opinion of the Design Professional, properly a part of the work of the Contractor, or understood to be done as part of the work of the contractor, or understood to be done as part of any item or work listed in these specifications shall be classed as extra work. The contractor shall not in any case perform any extra work without receiving a signed Change Order or Construction Change Directive from the Design Professional. All Change Orders must be pre-approved by the Board of Freeholders. No contract may be increased by Change Orders by more than twenty percent (20%) of the original Contract sum.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Design Professional and signed by the Owner and Design Professional, directing a change in the Work prior to agreement or adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may be 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 a 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 Subparagraph 7.3.6 and 7.3.10

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Design Professional 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.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor 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.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the contract Sum, the method and the adjustment shall be determined by the Design Professional on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of a increase in the Contract Sum, an allowance for overhead and profit in accordance with the schedule set forth in Subparagraph 7.3.10. In such case, the Contractor shall keep and present, in such form as the Design Professional may prescribe, an itemized accounting together with appropriate supporting data.

Determination of the net cost for the purposes of this Subparagraph 7.3 CONSTRUCTION CHANGE DIRECTIVES and Subparagraphs. 7.2 CHANGE ORDERS shall be limited to the following:

- .1 cost of labor, including social security, old age and unemployment insurance, fringe benefits required by Law, and workers compensation insurance;
- .2 costs of materials, supplies and equipment, including cost of transportation whether incorporated or consumed;
- .3 costs for rental of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

Costs that are specifically excluded for the purposes of this Subparagraph 7.3 CONSTRUCTION CHANGE DIRECTIVES and Subparagraphs 7.2 CHANGE ORDERS are as follows:

- .1 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work, and;
- .2 additional costs of supervision, field office rental, or field office personnel or other field office or main office overhead;

The Total Cost calculated by the methods in this Subparagraph, 7.3.6, shall constitute the "Net Cost" attributable to the Change in the Contract Sum and shall be the basis to which the allowable overhead and profit, as defined in 7.3.10, applies.

7.3.7 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Design Professional. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of next increase, if any with respect to the change.

7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Design Professional will make an interim determination for purposes of monthly certification for payment for those costs. That 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 4.

7.3.9 When the Owner and Contractor agree with the determination made by the Design Professional concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.3.10 Subparagraphs 7.2 CHANGE ORDERS and 7.3 CONSTRUCTION CHANGE DIRECTIVES, the allowable overhead and profit to be applied to the net cost of the change in the Contract Sum shall be based on the following schedule:

1. For all extra work or portion thereof performed by the Contractor's own forces, the total change in the Contract Sum shall be limited to the net cost of the extra work plus a maximum allowance of fifteen percent (15%) of the net cost for all of the General Contractor's overhead costs and profit.

2. For all extra work or portion thereof performed by a Subcontractor(s), the total change in the Contract Sum shall be limited to the net cost of the extra work performed by the Subcontractor plus a maximum allowance of fifteen percent (15%) of that net cost for the Subcontractor's overhead and profit plus a maximum allowance of five percent (5%) of the combination of Subcontractor's net cost plus any net costs that may be accrued by the Contractor for the Contractor's overhead and profit. In no case shall the total allowance for overhead and profit on a Subcontractor(s) work exceed twenty percent (20%) of the total net cost of the Work.
3. Costs for Insurance and Bonds shall be included in the percentages listed above as allowable overhead and profit and shall not be listed as separate or additional line items when calculating the total change to the Contract Sum for Change Orders or Construction Change Directives.

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 work to be performed under this contract shall commence after the required insurance has been obtained and approved and within seven days after issuance of the Notice To Proceed by the Design Professional. The contract time shall commence as of the date of the Notice To Proceed unless otherwise specified in the agreement.

8.1.3 The date of Substantial Completion is the date certified by the Design Professional in accordance with Paragraph 9.8

8.1.3.1 Pursuant to Subparagraph 8.1.3 as supplemented hereinafter as between the Owner and Contractor as to all acts or failures to act occurring prior to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such Date of Substantial Completion; as to all acts or failures to act occurring subsequent to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate of Payment.

8.1.4 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 Design Professional in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. the date

of commencement shall be established by the Contract Documents or a notice to proceed given by the Design Professional.

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

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 and believes that the Contract Time should be extended due to changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by other causes which the Design Professional determines may justify, such extension then the Contract Time shall be extended by Change Order for such reasonable time as the Design Professional may determine.

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3

8.3.3 This paragraph 8.3 does not preclude recovery of damages for delay by the Owner as follows:

1. The Contractor understands and agrees that all Work must be performed in an orderly and closely coordinated sequence so that the date for substantial completion may be met.

2. If the Contractor fails to complete his work or fails to complete a portion of his work necessary to allow another Contractor to commence his work, he shall pay the Owner as liquidated damages, and not as a penalty, the sum stated in the Contract Documents Form of Agreement for each day of delay. Such amount is agreed upon as a reasonable and proper measure of damages which the Owner will sustain each calendar day by failure of the Contractor to complete work within the stipulated time.

3. Substantial Completion will be determined by the Design Professional, and shall be deemed, to be completion of the whole work for purposes of tolling the Municipal Mechanics Lien Law.

4. For damages 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 in accordance with the provisions of Paragraph 9.5

5. If the Owner shall suffer financial loss if the project is not substantially complete on the date set forth in the Contract Documents. The Contractor (and the Contractor's Surety) shall be liable for and pay to the Owner the sums hereinafter stipulated and fixed, agreed as liquidated damages for each calendar day of delay until the work is substantially complete or the actual costs of financial loss suffered on account of the project not being substantially complete on the date set forth in the Contract Documents, whichever is greater.

8.3.4 Apart from an extension of time, no payment or allowance of any kind shall be made to the Contractor as compensation for damages on account of hindrance or delay from any cause in the progress of the work whether such delay be avoidable or unavoidable. The Contractor agrees that

he will make no claim for compensation, damages, or litigation of damages for any such delays, and will accept in full satisfaction for such delays said extension of time.

8.3.5 The Contractor agrees that the Owner can deduct from the Contract Sum, any wages paid by the Owner to any Inspector or Design Professional or other professional necessarily employed by the Owner for any number of days in excess of the number of days allowed in the Contract Documents for completion of Work.

8.3.6 Precedent to claims for delay where the cause of delay is due to weather conditions, 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 preceding sentence shall be construed according to this formula; Average rainfall (or snow or low temperature) for the past five (5) years.

8.3.7 The Contractor agrees that if any delay in the Contractor's work unnecessarily delay the work of any 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 to Contractor under this Contract. The Design Professional shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor. The Design Professional's decision shall be considered valid.

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 for the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Design Professional a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Design Professional may require. This schedule, unless objected to by the Design Professional, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 All payment applications shall comply with the Prompt Payment Act N.J.S.A 2A:30A-1. Payment Applications shall not be submitted more frequently than once each calendar month. The billing date shall be the date upon which the Design Professional receives a notarized Application for Payment from the Contractor for his own company as General Contractor and each of the Sub-Contractors listed on the bid form. ("Listed" subcontractors are those providing Plumbing and Gas Fitting, HVAC, Electrical, Structural Steel and Ornamental Iron Work.) The Contractor shall be responsible for reviewing, approving and submitting the Application for Payment. The Applications for Payment shall be submitted on AIA Document G702 and G703, and include an Approved and Certified County Voucher form obtainable from the County Purchasing Department, a completed Payroll Affidavit Form WH-347(1/68) obtainable from the US Department of Labor Wage and Hour Division. The Contractor must also submit additional AIA G702 and G703 forms summarizing the particular applications for payment.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of change in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Design Professional, but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

9.3.2 At the Owner's option, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures 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.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making claim by reason of having provided labor, materials and equipment relating to the work.

9.3.4 By the Contractor's signature on the AIA 702 & 703 Forms and their County Voucher Forms, certifies his agreement that the amounts stated on those forms are the correct amounts being due each of the Sub-Contractors.

9.3.5 Withholding of Partial Payment (Retainage); the Owner shall withhold 2% of the amount due on each partial payment paid to the Contractor pending completion of the contract or agreement.

9.3.6 Upon 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 released and paid in full to the contractor within forty five (45) days of the date as established by the Design Professional and the Owner, without further withholding of any amounts for any purpose whatsoever, provided that the contract has been satisfactorily completed.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The issuance of a Certificate for Payment will constitute a representation by the Design Professional to the Owner, based on the Design Professional's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Design Professional's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. 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 Design Professional. The issuance of a certificate for payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Design Professional 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 material 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 Design Professional may withhold a Certificate for Payment if in the Design Professional's opinion the representation to the Owner required by Subparagraph 9.4.2 cannot be made. If the Design Professional is unable to certify payment as shown on the Payment Application, the Design Professional will notify the Contractor and the Owner. The Design Professional may also withhold a Certificate for Payment or, because of subsequently discover evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Design Professional's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2, because of:

- .1 defective Work not remediated;
- .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 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 another 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; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.6 PROGRESS PAYMENTS

9.6.1 If the General Contractor has performed in accordance with the provisions of the contract and these specifications and the billing for the work has been approved and certified by the Design Professional, the amount due will be paid not more than 30 days after the billing date. Payment Applications certifying to work that has not been completed or that has not been completed in a satisfactory manner by either the Contractor or a Listed Subcontractor shall be returned to the General Contractor for correction. Payment applications containing incorrect amounts and/or mathematical errors shall also be returned to the General Contractor for correction. Submittal of a Corrected Payment Application shall be considered a new Application for Payment for purposes of N.J.S.A. 2A:30A-1 et seq.

All disputes between owners, prime contractors, subcontractors or sub subcontractors shall provide that disputes regarding whether a party has failed to make payments required pursuant to N.J.S.A. 2A:30A-1 et seq., shall be submitted to alternative dispute resolution in accordance with Section 4.6 of these Specifications.

The provisions of this Subparagraph 9.6.1 apply to Progress Payments, Final Payments and Retainage Monies.

9.6.2 If a subcontractor or sub subcontractor has performed in accordance with the provisions of its contract with the prime contractor or subcontractor and the work has been accepted by the owner, the Design Professional, or the General Contractor, as applicable, and the parties have not otherwise agreed in writing, the General Contractor shall pay to its subcontractor, excluding the Listed Subcontractors, and the subcontractors shall pay to its sub subcontractor within 10 calendar days of the receipt of a progress payment, final payments or receipt of retainage monies, the full amount received for the work of the subcontractor or sub subcontractor based on the work completed or the services rendered under the Contract.

9.6.3 The Design Professional 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 Design Professional and Owner on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner nor Design Professional shall have an obligation to pay or to see the payment of money to a Subcontractor except as may otherwise be required by law.

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

9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the contractor for breach of the requirements of this provision.

9.6.8 As per N.J.S.A. 40A:11-16, county entities entering into a lump sum, single overall contract for construction are required to issue direct checks to the listed sub-contractors (Plumbing and Gas Fitting, HVAC, Electrical, Structural Steel and Ornamental Iron Work See the bid form Section 00410). Monies due the listed subcontractor cannot be paid to the general contractor.

Checks to the listed sub-contractors will be issued only upon written direction from the general contractor verifying the amount to be paid and the quantities of work performed.

THIS DOES NOT CONSTITUTE A CONTRACTURAL RELATIONSHIP BETWEEN THE COUNTY AND THE LISTED SUB-CONTRACTORS, NOR DOES IT IMPLY THAT THE COUNTY "PAYS" THE

SUB-CONTRACTOR, NOR DOES IT IN ANY WAY RELIEVE THE GENERAL CONTRACTOR FROM HIS MANAGEMENT OF OR FIDUCIARY RESPONSIBILITIES TO THE LISTED SUB-CONTRACTORS.

9.7 FAILURE OF PAYMENT

9.7.1 If the Design Professional does not issue a Certificate for Payment, through no fault of the Contractor, within seven (7) days after receipt of the Contractor's Application s for Payment, or if the Owner does not pay the Contractor within seven (7) days after the date established in the Contract Documents the amount certified by the Design Professional or awarded by arbitration, then the Contractor may, upon seven additional days' written notice two the Owner and Design Professional , stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay, and start-up, plus interest as provided in the Contract Documents. If a payment due under the Prompt Payment Act is not made in a timely manner, the delinquent party shall be liable for the amount of money owed under the contract, plus interest at a rate equal to the prime rate plus 1%.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the state in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

9.8.2 When the Contractor considers that the Work, or portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Design Professional a comprehensive list of items to be completed or corrected 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.

9.8.3 Upon receipt of the Contractor's list, the Design Professional will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Design Professional'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 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 Design Professional. In such case, the Contractor shall then submit a request for another inspection by the Design Professional to determine Substantial Completion.

9.8.4 When the Work or designated portion thereof is substantially complete, the Design Professional will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance and shall 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 or the date of the Certificate of Occupancy whichever is the latter. The Contractor shall guarantee that work or materials provided by Suppliers, Subcontractors or others for use in the project are also bound by this timeline.

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 such Certificate. Upon such acceptance and Consent of Surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.8.6 The payment at substantial completion shall be sufficient to increase the total payments to 98% of the contract sum, less such amounts as the Design Professional shall determine for all incomplete work and unsettled claims.

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 state when the such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Clause 11.4.1.5 and authorized by public authorities having jurisdiction of the Work. 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 Design Professional as provided under Subparagraph 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 Design Professional.

9.9.2 Immediately prior to such partial occupancy for use, the Owner, Contractor and Design Professional 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 Unless otherwise agreed upon, 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.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final application for Payment, the Design Professional will promptly make such inspection and, when the Design Professional finds the Work acceptable under the Contract Documents and Contract fully performed, the Design Professional will promptly issue a final Certificate for payment stating that the best of the Design Professional's knowledge, information and

belief, and on the basis of the Design Professional's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of 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 Design Professional's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Design Professional (1) and 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. 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. If such lien 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 such lien, including all costs and reasonable attorney's fees.

9.10.3 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
2. failure of the Work to comply with the requirements of the Contract Documents; or
3. terms of special warranties required by the Contract Documents

9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material 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

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

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide 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 or which has been incorporated into the Work, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities as well as any other real or personal property not designated for removal, relocation or replacement in the course of construction.
- .4 the Contractor shall replace all such materials and equipment which may be lost, stolen or damaged at his expense, whether or not such materials or equipment have been entirely or partially paid for by the Owner

10.2.2.1 Contractor shall comply with all regulations required by OSHA and PEOSHA.

10.2.2.2 The Contractor shall conform to all applicable New Jersey Department of Environmental Protection regulations.

10.2.2.3 Contractors must comply with Construction and Environment Standards contained in Federal and State Regulations and other applicable laws.

10.2.2.4 It is the Contractor's responsibility to determine the existence of potentially hazardous materials, including lead, to notify the Owner of the presence of such hazardous materials and to protect his workmen and the work area.

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

10.2.3 The Contractor shall 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 owners and users of adjacent sites and utilities.

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 Clauses 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 Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Design Professional 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 Paragraph 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 Design Professional.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 HAZARDOUS MATERIALS

10.3.1 The Contractor shall promptly notify the Design Professional 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.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on part of the Contractor, the Contractor is held liable 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 indemnify the Contractor for all cost and expense thereby incurred.

10.6 EMERGENCIES

10.6.1 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 provide in Paragraph 4.3 and Article 7.

ARTICLE 11. INSURANCE AND BONDS

11.1 CONTRACTORS LIABILITY

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contract and Owner from claims set forth herein which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by and of them, or by anyone for whose acts any of them may be liable.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than the limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence of claims-made basis, shall be maintained without interruption from date of commencement of Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and

are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.1.4 WORKMEN'S COMPENSATION

11.1.1.4 The Contractor shall take out and maintain Workmen's Compensation insurance to fully protect the OWNER as required by existing law, or as such may be amended during the life of this contract. In case the Contractor shall subcontract any portion of the work, he shall require that all employees of the subcontractor are properly covered by such Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work under this contract is not protected under Workmen's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide adequate and suitable insurance for the protection of his employees not otherwise protected.

11.1.5 PUBLIC LIABILITY, PROPERTY, AUTOMOBILE AND ASBESTOS INSURANCE

11.1.5.1 ACCIDENTS, INJURIES, DAMAGES: When necessary for the Contractor, either as principal or by agent or employee, to enter upon the premises or property of the County in order to construct, erect, repair, inspect, make delivery or remove property hereunder, the Contractor hereby covenants and agrees to take, use, provide and make all proper, necessary and sufficient precaution, safeguards and protection against occurrence or happenings or any accidents, injuries, damages or hurt to any person or property during the progress of the Work herein covered, and to be responsible for, and to indemnify and save harmless the County from the payment of all sums of money by reason of all, or any, such accidents, injuries, damages or hurt that may happen or occur upon or about such work and all fines, penalties and loss incurred for or by any reason of the violation of any city borough ordinance regulation, or the laws of the State of New Jersey or of the United States, while the said work is in progress. Contractor shall carry insurance in accordance with provisions in Article of the General Supplementary Conditions of the Contract to indemnify the County against any claim for loss, damage or injury to property or persons arising out of the performance of the Contractor or his employees and agents of the services covered by the contract and the use, misuse, or failure of any equipment used by the Contractor or his employees or agents, and shall provide certificates of such insurance to the County. The aforesaid insurance coverage must remain in effect during the entire contract period and warranty maintenance period.

11.1.5.2 When asbestos work is included in the Project, asbestos insurance is required. The Contractor may, at his option, provide on policy in accordance with the limits set forth in these General and Supplementary Conditions for all risk except that related specifically to Asbestos Abatement activities, provided that the Asbestos Contractor supplies liability insurance in the amount specified here under General Liability/Asbestos Abatement Operations. In addition, both the General Contractor and the County of Burlington are to be named as additionally insured on the Asbestos Contractor's policy. If this option is exercised, both policies must be submitted in accordance with the specifications.

11.1.5.3 Without restricting the obligations and liabilities assumed under the Contract Documents, the Contractor shall, at his own cost and expense, purchase and maintain in force until final

acceptance of his work or the end of the warranty period, the forms of insurance coverage listed herein:

.A INSURANCE CERTIFICATES: Within seven (7) County business days from the date when the Notice of Award is delivered, the bidder to whom the Contract has been awarded shall submit insurance certificates, binders and policies as required. Certificates shall be issued to:

Burlington County Board of Commissioners
49 Rancocas Road
Mt. Holly, NJ 08060-6000
Attention: Insurance & Risk Management Division

Failure to submit insurance certificates, binders and policies within the specified time shall constitute a default for which the Board may take whatever actions that are allowed under the Contract.

In the event that the Contractor provides evidence of insurance in the form of certificates of insurance, valid for a period of time less than the period during which the Contractor is required by the terms of this Contract to maintain insurance, said certificates are acceptable, but the Contractor shall be obligated to renew its insurance policies as necessary and to provide new certificates of insurance so that the County is continuously in possession of evidence of the Contractor's insurance in accordance with the foregoing provisions.

However, the original policies of Owner's Protective Policy shall at this time be delivered to the OWNER for its possession.

All policies as hereinafter required shall be so written that the OWNER will be notified of cancellation or restrictive amendment at least thirty (30) days prior to the effective date of such cancellation or amendment.

B. REQUIRED INSURANCE: The Contractor shall take out and maintain during the life of this Contract the various types and amounts of all risk insurance as required to protect the Contractor, the OWNER and any subcontractor performing work covered by this Contract from claims for damages or personal injury including accidental death, as well as from claims for property damages which may arise from operations under this Contract, whether such operations be by himself or by any subcontractor or by anyone directly employed by either of them.

11.1.5.4 ALL INSURANCE COVERAGE LISTED BELOW will be required for every construction project with the exception of item # 6 (GENERAL LIABILITY/ASBESTOS ABATEMENT INSURANCE) which will only be required when hazardous material abatement is included within the scope of work.

1. COMPREHENSIVE GENERAL LIABILITY INSURANCE: The minimum limit of liability shall be \$5,000,000 each occurrence/\$5,000,000 aggregate combined single limit for bodily injury and property damage.

2. COMPREHENSIVE AUTOMOBILE LIABILITY INSURANCE: with minimum limits of liability in the amount of \$5,000,000 per occurrence as a combined single limit for bodily injury and property damage.

3. OWNER'S AND CONTRACTOR'S PROTECTIVE INSURANCE: A separate Owner's and Contractor's Protective Liability Insurance policy shall be provided. The minimum limit of liability shall be \$4,000,000 per occurrence/\$4,000,000 aggregate as a combined single limit for bodily injury and property damage. The policy is to be written for the benefit of the County, its officers and employees; they are to be named as the insured.

4. WORKER'S COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE: Worker's Compensation Insurance shall be provided in accordance with the requirements of the laws of this State and shall include an all states' endorsement to extend coverage to any state which may be interpreted to have legal jurisdiction. Employer's Liability Insurance shall be provided with the following minimum limits.

\$500,000 Each Accident

\$500,000 Disease Each Employee.

\$500,000 Disease Aggregate Limit.

5. UMBRELLA OR EXCESS POLICY: can be used in conjunction with the primary policies to meet the limits required.

6. GENERAL LIABILITY/ASBESTOS ABATEMENT INSURANCE: General Liability/Asbestos Abatement Insurance naming the Owner, Consultant and General Contractor as additionally insured and covering all Asbestos Abatement related operations in connection with the project with limits of \$4,000,000 each and \$4,000,000 aggregate.

7. LIABILITY INSURANCE MAINTENANCE GUARANTEE PERIOD: Liability insurance during the maintenance guarantee period will be required as part of the close out documents of the project, naming the Owner as additionally insured for a period of 24 months or two years commencing with the date of Substantial Completion or the Certificate of Occupancy, whichever is the latter of the project by the County at limits required under a 11.1.1.11, B 1 & 2.

8. PROPERTY INSURANCE: Property insurance will be required as follows depending on work being performed, new construction or renovation/installation:

8.A NEW CONSTRUCTION – BUILDERS RISK INSURANCE:

1. The Contractor shall purchase and maintain builder's risk insurance on a replacement cost basis with a limit equal to or exceeding the full insurable value of the work. This insurance shall be maintained until Substantial Completion or the Certificate of Occupancy, whichever is the latter of the work by the County of Burlington.

2. The Owner and the Contractor must be specifically included as named insureds. Subcontractors and sub-subcontractors shall be included by naming them as additional insureds.
3. This builder's risk insurance shall include coverage for the following types of property:
 - .a All structures to be constructed, under construction or already constructed;
 - .b All materials, equipment, machinery and supplies which are to be incorporated into the Project.
 - .c Temporary structures of any nature whatsoever; and
 - .d Underground property, including but not limited to, foundations, pump stations, pipes, drains, tanks and connections.
4. The builder's risk insurance shall be written on all-risks policy form.
5. Coverage shall be written on an agreed value basis. Accordingly, any coinsurance or contribution clause shall be deleted.

.8B RENOVATIONS/INSTALLATIONS - INSTALLATION FLOATER INSURANCE:

- .1 The Contractor shall purchase and maintain an Installation Floater on a replacement cost basis with a limit equal to or exceeding the full insurable value of the work. The insurance shall be maintained until Substantial Completion or the Certificate of Occupancy, whichever is the latter of the work by the County of Burlington.
- .2 The Owner and the Contractor must be specifically included as named insureds. Subcontractors and sub-subcontractors shall be included by naming them as additional insureds.
- .3 This Installation Floater shall include coverage for the following types of property:
 - a. Renovations/installations under construction;
 - b. All materials, equipment, machinery and supplies, which are to be incorporated into the Project.
 - c. Temporary structures of any nature whatsoever; and
 - d. Underground property, including but not limited to, foundations, pump stations, pumps, pipes, drains, tanks and connections.
- .4 The Installation Floater insurance shall be written on an all-risks policy form.

.5 Coverage shall be written on an agreed value basis. Accordingly, any coinsurance or contribution clause shall be deleted.

11.1.6 Insurance coverage in the minimum amounts set forth herein shall not be construed to relieve the Contractor for liability in excess of such coverage, nor does it preclude the County from taking such other actions as are available to it under any other provisions of this Contract or otherwise in law.

11.1.7 The Comprehensive General Liability and Comprehensive Automobile Liability policies shall name the Burlington County Board of Chosen Freeholders, its officers and employees as additional insureds.

11.1.7 In the event the Contractor fails or refuses to renew its insurance policy or the policy is canceled, terminated, or modified so that the insurance does not meet the requirements of this subsection, the County may refuse to make payment of any further monies due under this Contract or refuse to make payment of monies due or coming due under other contracts between the Contractor and the County. The County may use monies retained under this paragraph to renew the Contractor's insurance for the periods and amounts referred to above. Alternately, the County may default the Contractor and direct the surety to complete the Project. During any period when the required insurance is not in effect, the County may suspend performance of the Contract. If the Contract is so suspended, additional compensation or extension of Contract Time is not due on account thereof.

11.4.11 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.5.1 The Contractor shall provide both a Performance and a Payment Bond covering faithful performance of the Contract and payment of obligations arising there under as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.5.2 PERFORMANCE AND PAYMENT BOND REQUIREMENTS: Within ten (10) days of the date of the notice of intent to award a contract to the bidder, the bidder must submit a performance bond in an amount equal to 100% of the contract amount to the County of Burlington, via the County's representative.

The Performance and Payment Bond must be drawn to the Board of Commissioners of the County of Burlington in an amount equal to the contract amount. It must be provided in substantially the format as found at N.J.S.A. 2A: 44-147, a copy of which is included in these specifications.

No Performance Payment Bond will be accepted by the Board of Commissioners unless there is attached thereto a Surety Disclosure Statement and Certification in substantially the form provided in these Section 00490.

The submission of a fully compliant Payment and Performance Bond is required prior to the County's issuance of a Purchase Order by the County and a Notice to Proceed by the County's Representative.

11.5.3 QUALIFICATIONS OF SURETY ISSUING A PAYMENT AND PERFORMANCE BOND: In accordance with N.J.S.A. 2A: 44-143, the Surety issuing the Payment and Performance Bond must meet the following qualifications which vary according to the amount of the Payment and Performance Bond required.

.1 SURETY REQUIREMENTS FOR ALL BONDS-ALL AMOUNTS: For all Payment and Performance Bonds, no matter what the amount, the surety must have the minimum surplus and capital stock or net cash assets required by N.J.S.A. 17: 17-6 (Capital required for stock company) or N.J.S.A. 17:17-7 (Capital required for mutual company) whichever is appropriate at the time the solicitation for bids is issued.

.2 SURETY REQUIREMENTS FOR BONDS AMOUNTS BETWEEN \$850,000 AND \$3.5 MILLION: For Payment and Performance Bonds in these amounts, the Surety must, in addition to requirements listed above, provide the following:

a. A CURRENT CERTIFICATE OF AUTHORITY issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. Section 9350 that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570

or

b. CERTIFICATION OF OPERATION AND RATING which states that the surety has been operational for a period in excess of five years and is rated by one of the rating companies listed in N.J.A.C. 11:1-41.3 in one of three highest rating categories set forth in Appendix A to the same regulation promulgated by the New Jersey Commissioner of Insurance.

.3 SURETY REQUIREMENTS FOR BOND AMOUNTS OVER \$3.5 MILLION: For Payment and Performance Bonds in these amounts, the Surety must, in addition to requirements listed above, provide the following:

(a) A CURRENT CERTIFICATE OF AUTHORITY (As defined above in .2)

and

(b) CERTIFICATION OF OPERATION AND RATING (As defined above in .2)

Note: If the surety for bonds in excess of \$3.5 million does not hold a certificate of authority issued by the United States Secretary of the Treasury, said surety is exempt from the requirement to hold such a certificate if the surety meets the standards of the New Jersey Commissioner of Insurance

and is listed by the New Jersey Department of Insurance as an acceptable surety for provision of bonds on public works contract.

11.5.4 MAINTENANCE BOND: The Contractor shall provide a Maintenance Bond as specified below:

11.5.4.1 Before final payment is made, the Contractor shall furnish a Maintenance Bond or Guarantee made in favor of the County of Burlington in a sum equal to fifteen percent (100%) of the total contract price, including all supplemental and extra work performed on the project, as delineated in approved change orders furnished by the Contractor.

11.5.4.2 The Form of Maintenance Bond or Guarantee and the Surety Company providing said Bond or Guarantee shall be satisfactory to the County of Burlington. The Maintenance or Guarantee Bonds shall remain in full force and effect for a period of two (2) years from the date of Substantial Completion or the Certificate of Occupancy whichever is the latter (not substantial completion) of the project by the County. The date of which shall be established by the Design Professional.

11.5.4.3 The Maintenance Bond or Guarantee shall provide that the Contractor guarantees to replace for said period of two (2) years all work performed and all materials furnished according to the terms and performance requirements of the contract, and make good defects thereof which have become apparent before the expiration of the said period of two (2) years.

11.5.4.4 If in the judgment of the Design Professional, any part of the project needs to be replaced, repaired or made good during the specified Maintenance Bond or guarantee period, the Design Professional will so notify the Contractor in writing. If the Contractor refuses or neglects to start such work within five (5) days from the date of service of such notice or at such other time as the Design Professional may direct, or if the Contractor fails to complete such work within the time prescribed by the Design Professional, the County will have the work done by others and the cost thereof shall be paid by the Contractor or its Surety. Before the Surety is released from its Maintenance Bond or Guarantee, the Design Professional shall certify in writing that the foregoing obligation has been duly performed.

12.2 UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Design Professionals Request or to requirements specifically expressed in the Contract Documents, it must if required in writing by the Design Professional, be uncovered for the Design Professional's examination and be replaced at the contractors expense without change in the Contract Time

12.1.2 If a portion of the Work has been covered which the Design Professional has not specifically required to examine prior to its being covered, the Design Professional may request to see such work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition of the Contractor's obligations under Paragraph 3.5, if, within two-years after the date of final acceptance after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an 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 written 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 Design Professional, the Owner may correct it in accordance with Paragraph 2.4.

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition to the Contractor's obligations under Paragraph 3.5, if, within two years after the date of Substantial Completion of the Work or designated portion thereof of after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, and 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 written notice from the Owner to do so unless the Owner has previously given the contractor written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction of the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner of Design Professional, the Owner may correct if in accordance with Paragraph 2.4.

12.2.2.2 The two-year period for correction of Work shall be extended with respect to portions of Work first performed after Final Acceptance by the period of time between Final Acceptance and the actual performance of the Work.

12.2.3 The Contractor shall remove from the site portions of the Work which 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, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the two-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, 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

12.3.1 If the Owner prefers to accept Work which 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 adjustments shall be effected whether or not final payment has been made.

13.1 MISCELLANEOUS PROVISIONS

13.1.1 The contract shall be governed by and construed in accordance with the laws of the State of New Jersey, including but not limited to the Local Public Contracts Law, N.J.S.A. 40A:11-1 et seq., and the regulations of the Department of Community Affairs, at N.J.A.C 5:34-1 et seq. Funding all contracts are subject to the availability and appropriation of funds

13.2.1 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect 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, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE:

13.3.1 Written notice shall be deemed to have been duly served if delivered by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

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

13.4.2 No action or failure to act by the Owner, Design Professional 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 in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. 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 Design Professional timely notice of when and where tests and inspections are to be made so that the Design Professional may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not be requirements until after bids are received.

13.5.2 If the Design Professional, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under subparagraph 13.5.1, the Design Professional 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 Design Professional of when and where tests and inspections are to be made so that the Design Professional may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3 shall be at the Owner's expense.

13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 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 Design Professional's services and expenses shall be at Contractor's expense.

13.5.4 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 Design Professional.

13.5.5 If the Design Professional is to observe tests, inspections or approvals required by the Contract Documents, the Design Professional will do so promptly and, where practicable, at the normal place of testing.

13.6 INTEREST

13.6.1 The Contractor shall not be entitled to any payment of interest for any reason, action, or inaction by the Design Professional or Owner with the exception of interest permissible within the Prompt Payment Act N.J.S.A. 2A: 30A-1.

13.6.2 Any payments withheld for time delays, faulty materials, or workmanship, shall not bear interest for period of delay or non-acceptance.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

1. Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, and applicable statutes of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events no later than such date of Substantial Completion

2. Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion, and prior to issuance of the final Certificate for Payment, and applicable statute of limitations shall commence to

run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

3. After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final certificate for Payment, and applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provide under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform and duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14. TERMINATION OR SUSPENSION OF THE CONTRACT

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract of the Contractor:

1. persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials
2. fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and Subcontractors
3. persistently disregards laws, ordinances, or rules, regulations, or orders of a public authority having jurisdiction; or
4. otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, 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 written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety.

.1 take possession of the site and of all materials, equipment, tools and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.4; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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 Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Design Professional's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the contractor. If such costs damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be

certified by the Design Professional, upon application, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVIENCE

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 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
2. that an equitable adjustment is made or denied under another provision of the Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convince and without cause. 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 state in the notice, terminate all existing subcontractors and purchase orders and enter into no further subcontracts and purchase orders.

14.4.3 In case of such termination of the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit of the Work not executed.

*****END OF SECTION 00300 - SUPPLEMENTARY GENERAL CONDITIONS*****

**SECTION 00400
BIDDERS CHECKLIST**

This checklist has been provided to assist bidders with preparing their bid submission. Bidders must include a signed Bidder's Checklist with their bid submission under the "Response Attachments" tab. Failure to include those items marked **MANDATORY on the Bidders Checklist** with the bid shall be deemed a fatal defect that shall render the bid submission nonresponsive. Bids submitted without fully executed copies of any form marked as MANDATORY may also be rejected.

	SECTION	BIDDER CHECK OFF		CHECK OFF For County Use Only
Signed Bidders Checklist Submit electronically under the "Response Attachments" tab (MANDATORY)	00400			
Bid Form Agreement Submit electronically under the "Attributes" tab (MANDATORY)	00410			
Bid Prices Submit electronically under the "Line Items" tab (MANDATORY)	00410			
Name and Address of Listed Prime Subcontractor(s) Submit electronically under the "Attributes" tab (MANDATORY)	00410			
Listed Subcontractor(s) Documents/Cert. (BRC, EEO documentation, etc.) Submit electronically under the "Response Attachments" tab (Due Prior to Award)	00410			
Acknowledgement of Addenda (if issued) Submit electronically under the "Attributes" tab (MANDATORY)	00410			
Insurance Statement Submit electronically under the "Response Attachments" tab (MANDATORY)	00410			
Bid Guarantee Submit <u>copy</u> electronically under the "Response Attachments" tab Deliver <u>original</u> per the specifications (MANDATORY)	00420			
Consent of Surety Submit <u>copy</u> electronically under the "Response Attachments" tab Deliver <u>original</u> per the specifications (MANDATORY)	00430			

Statement of Ownership Disclosure Submit electronically under the “Attributes” tab (MANDATORY)	00440			
Non-Collusion Certification Submit electronically under the “Response Attachments” tab (MANDATORY)	00450			
Qualification Questionnaire Submit electronically under the “Attributes” tab (MANDATORY)	00460			
Executed Form of Agreement Submit electronically under the “Response Attachments” tab (Must be submitted 10 days after award)	00470			
Performance & Payment Bond (Must be submitted 10 days after award)	00480			
Disclosure Statement & Certification Submit electronically under the “Response Attachments” tab (MANDATORY)	00490			
Public Works Contractor Registration Cert. (PWCRC) for both the Bidder/Contractor AND listed subcontractor(s) Submit electronically under the “Response Attachments” tab (MANDATORY) (*See note below)	00500			
Affirmative Action (EEO) Documentation Submit electronically under the “Response Attachments” tab (Due Prior to Award)	00520			
NJ Business Registration Certificates Submit electronically under the “Response Attachments” tab (Due Prior to Award)	00540			
Responsible Contractor/Subcontractor Policy Certification forms for both the Bidder/Contractor AND listed subcontractor(s) Submit electronically under the “Response Attachments” tab (MANDATORY)	00560			
Letter of Assent(s) for Project Labor Agreement(s) Submit electronically under the “Response Attachments” tab (MANDATORY) (*See note below)	00570			
Federal Non-Debarment Certification Submit electronically under the “Attributes” tab (MANDATORY)	00600			

Anti-Discrimination Agreement Submit electronically under the "Attributes" tab (MANDATORY)	00700			

***IMPORTANT NOTES:** All Public Works Contractor Registration Certificates (PWCRC) shall be submitted by the deadline for bid submission. Contractors and the subcontractor(s) listed in the bid proposal must be registered pursuant to the Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq., with the New Jersey Department of Labor, Division of Wage & Hour Compliance, at the time the bid is opened. Failure of a contractor or a listed subcontractor to be registered at the time the bid is opened is a material deviation from specifications that cannot be cured after the bid has been opened; therefore, no award can be made to such a contractor.

A valid PWCRC and Responsible Contractor/Sub-Contractor Policy Certification form for both the bidder and their listed prime subcontractor(s) must be submitted with the bid under the "Response Attachments" tab. The PWCRC(s) must be valid at the time bids are due to the County.

Bidders must also include their completed Letter of Assent(s) with their bid submission under the "Response Attachments" tab. A Letter of Assent is included in the specifications for each Project Labor Agreement.

Name of Company: _____

Signature of Bidder: _____

Print Name: _____

Title: _____

Date: _____

****END OF SECTION 00400 – BIDDERS CHECKLIST****

**SECTION 00410
BID FORM**

Bids Due:

September 16, 2026 at 10:30 am (Local Time)

Submit Bids Electronically at <https://burlcobids.ionwave.net>.

PROJECT NAME:

Burlington County Agricultural Center-2026 Improvements

PROJECT CONTRACT DOCUMENTS:

DATE:	June 30, 2026
ARCHITECTURAL CONSULTANTS:	Taylor Design Group
ARCHITECT'S ID NUMBER:	2005-108.13.01
COUNTY ID NUMBER:	CPU-26-0051

PROJECT SCOPE OF WORK:

The project scope will consist of the following:

Furnishing of all materials, equipment, services and labor necessary to construct proposed improvements to the Burlington County Agricultural Center including but not limited to new restroom building, brick walkways, site lighting, fencing, signage, landscaping, irrigation and other park appurtenances.

Trades Required:

- General Construction
- Plumbing
- Electrical
- Mechanical/HVAC

SUBMIT BIDS TO:

Burlington County Agricultural Center- 2026
Improvements CPU-26-0051
500 Centerton Road
Moorestown, NJ 08057
June 30, 2026

BID FORM

Page 00410-1

Bids shall be submitted at <https://burlcobids.ionwave.net>. Bids must be electronically submitted to the County of Burlington on or before the time and date specified in the Advertisement for Bids. Bids shall not be accepted after the time and date specified.

ALLOWANCES:

THE TOTAL BASE BID SHALL INCLUDE THE FOLLOWING AMOUNTS:

General Construction Allowance:

\$35,000

LINE ITEM AMOUNTS:

*****SEE LINE ITEMS ON NEXT PAGE*****

BID FORM

Item #	Item Description	Quantity (Approx.)	Unit	Unit Price-in Dollars & Cents	Extended Price- in Dollars & Cents
Base Bid- Site Improvements					
1	Soil Erosion and Sediment Controls	1	LS		
2	Temporary Traffic Control Services & Devices	1	LS		
3	Site Clearing / Demolition	1	LS		
4	Earthwork	1	LS		
5	Borrow Topsoiling (onsite)	1	LS		
6	Water Service	1	LS		
7	Sanitary Sewer	1	LS		
8	Electrical Service to Restroom Building	1	LS		
9	Restroom Building	1	LS		
10	Site Lighting	1	LS		
11	Dense Graded Aggregate -4" Thick	125	SY		
12	Stone at Turf Pavers	986	SY		
13	Concrete Paving - 4" Thick	7	SY		
14	Brick Pavers	5,560	SF		
15	Stabilized Stone Paths	435	SY		
16	Stabilized Stone Paths (Modified)	1	LS		
17	Pavement Markings	1	LS		
18	Recycled Plastic Parking Strip	57	UT		
19	3-Rail Fence	165	LF		
20	Trash Enclosure	1	UT		
21	Timber Bollard	2	UT		
22	Maintenance Gate	1	UT		
23	Site Signage	3	UT		
24	Pet Water Fountain	1	UT		
25	Irrigation System	1	LS		
26	Shade Trees	2	UT		
27	Ornamental Trees	1	UT		
28	Lawn Seeding	1	LS		
29	General Construction Allowance	1	LS	\$35,000.00	\$35,000.00
Total Base Bid Subtotal (Sum of all Extended Prices for Base Bid Items):				(Amount in Numbers)	\$
(Amount in Words)					

UNIT PRICES:

UNIT PRICES ARE NOT APPLICABLE TO THIS SOLICITATION

TOTAL BASE BID AMOUNT:

THE TOTAL BASE BID AMOUNT FOR BURLINGTON COUNTY AGRICULTURAL CENTER – 2026 IMPROVEMENTS (CPU-26-0051) AS SPECIFIED IN THE CONTRACT DOCUMENTS INCLUDING ALLOWANCES, AMENDMENTS, ALL ADDENDA, LINE ITEM AMOUNTS AND UNIT PRICES SHALL BE CALCULATED BY ADDING THE EXTENDED PRICES OF ALL LINE ITEMS (#1-29).

Submit Bid Prices at <https://burlcobids.ionwave.net>

TOTAL AMOUNT BID:

THE TOTAL AMOUNT BID FOR BURLINGTON COUNTY AGRICULTURAL CENTER – 2026 IMPROVEMENTS (CPU-26-0051) AS SPECIFIED IN THE CONTRACT DOCUMENTS INCLUDING ALLOWANCES, AMENDMENTS, ALL ADDENDA, LINE ITEM AMOUNTS AND UNIT PRICES SHALL BE CALCULATED BY ADDING THE TOTAL BASE BID AMOUNT AND ANY ALTERNATES.

Submit Bid Prices at <https://burlcobids.ionwave.net>

IMPORTANT NOTE: Bidders shall be required to complete the Bid Form Agreement located under the “Attributes” tab within the solicitation at <https://burlcobids.ionwave.net>.

ALTERNATES:

SCHEDULE OF ALTERNATES:

ALTERNATES ARE NOT APPLICABLE TO THIS SOLICITATION

LISTED CONTRACTORS AND SUBCONTRACTORS:

In accordance with N.J.S.A. 40A:11-16 of the Local Public Contracts Law, Bidders shall list the name, address, and phone number of subcontractors with whom the Bidder will subcontract work to any of the trades listed below. Where applicable, current licenses of the named subcontractors must be submitted with the bid simultaneously with the list of subcontractors.

If a Bidder will contract with more than one subcontractor for any of the trades listed below, the Bidder shall submit with his bid a certificate signed by the Bidder listing each subcontractor to be used in that trade. The certificate shall set forth the scope of work, goods and services for which the subcontractor has submitted a price quote and which the Bidder has agreed to award to each subcontractor should the Bidder be awarded the contract. The certificate shall be submitted with the bid. The certificate may take the form of a single certificate listing all subcontractors, or, alternatively, a separate certificate may be submitted for each subcontractor. **If a Bidder does not submit a certificate or certificates with the bid to the contracting unit when more than one subcontractor will be hired in one of the following trades, the contracting unit shall award the contract to the next responsive bidder.**

Bidders shall list the name, address, and phone number of subcontractors with whom the Bidders will subcontract work to any of the trades listed below under the **Attributes** tab within the solicitation at <https://burlcobids.ionwave.net>. Bidder shall attach copies of all subcontractor documentation required as per the specifications under the **Response Attachments** tab within the solicitation at <https://burlcobids.ionwave.net>.

TRADE (S) REQUIRED FOR THE PROJECT: Electrical
 Plumbing
 Mechanical/HVAC

INSURANCE STATEMENT:

The Contractor must comply with the insurance requirements stated in this bid solicitation: **SECTION 00300 SUPPLEMENTARY GENERAL CONDITIONS ARTICLE 11. INSURANCE AND BONDS.**

As part of this bid submission, the Contractor shall attach a written statement from the Contractor's insurance broker that they will, upon successful award of this contract to their client, supply the bidder with insurance in the limits as required herein. The statement shall be attached under the Response Attachments tab located within the solicitation at <https://burlcobids.ionwave.net>.

*****END OF SECTION 00410 – BID FORM *****

**SECTION 00420
BID GUARANTEE FORM**

BID GUARANTEE:

Bids must be accompanied by a bid guarantee in the form of a bid bond, certified check, or cashier's check in the amount of 10% of the bid, not to exceed \$20,000 and shall be made payable to the Burlington County Treasurer. Bidders submit a **copy** of the bid guarantee online as part of the electronic bid submission. Additionally, the bidder must mail or deliver the **original** bid guarantee to the County. The original bid guarantee must be mailed or delivered to the County in a sealed envelope with the bid title and number clearly marked on the outside. The original bid guarantee is due to the County no later than the deadline for receipt of bids. **Failure to comply will result in rejection of the bid.**

The original bid guarantee can be delivered by hand or courier to:

County of Burlington
Department of Finance and Purchasing
County Office Building
First Floor, Room 104
49 Rancocas Road
Mount Holly, NJ 08060-6000

The original bid guarantee can be mailed to:

County of Burlington
Department of Finance and Purchasing
49 Rancocas Road
Post Office Box 6000
Mount Holly, NJ 08060-6000

***** END OF SECTION 00420 – BID GUARANTEE*****

SECTION 00430
CONSENT OF SURETY

Bidders must submit a **copy** of the consent of surety online as part of the electronic bid submission. Additionally, bidders must mail or deliver the **original** consent of surety to the County. The original consent of surety must be mailed or delivered to the County in a sealed envelope with the bid title and number clearly marked on the outside. The original consent of surety is due to the County no later than the deadline for receipt of bids. **Failure to comply will result in rejection of the bid.**

Bidders shall use the Consent of Surety form located on the next page. The text CANNOT BE ALTERED. The inclusion of additional conditions or other text in the Consent of Surety form shall be cause for the bid to be rejected.

The original consent of surety can be delivered by hand or courier to:

County of Burlington
Department of Finance and Purchasing
County Office Building
First Floor, Room 104
49 Rancocas Road
Mount Holly, NJ 08060-6000

The original consent of surety can be mailed to:

County of Burlington
Department of Finance and Purchasing
49 Rancocas Road
Post Office Box 6000
Mount Holly, NJ 08060-6000

CONSENT OF SURETY FORM

_____, Surety, authorized to carry on business in New Jersey by its signature hereupon or that of its attorney-in-fact, certifies to and promises the Board of County Commissioners of the County of Burlington that if a Contract for the _____, Project as listed in Section 00050 and also as referenced in the footer below, is awarded to _____, Principal, that it as Surety will execute the bond or bonds as required by the Specifications and will become surety in the full amounts set forth in the bid of its Principal for the faithful performance of all obligations of its Principal as Contractor. This Consent of Surety shall be valid for a period of ninety (90) days from the date of the bid opening.

SURETY

(Address)

BY _____
Attorney-in-Fact

_____, (Date)

Note: This text **CANNOT BE ALTERED**. The inclusion of additional conditions or other text will cause the bid to be rejected. Also, the surety must meet the requirements set forth elsewhere in this specification, including, but not limited to SECTION 00100- Instructions to Bidders. Therefore, the County strongly suggests that the prospective bidder submit their Consent of Surety on this form. Should a Surety insist on using their own form, its acceptance will be dependent on review by the County. Should any deviation in intent be found in the substituted form, the County will have no remedy except to reject the bid submitted by that bidder.

POWER OF ATTORNEY FOR ATTORNEY-IN-FACT MUST BE ATTACHED HERETO.

***** END OF SECTION 00430 – CONSENT OF SURETY*****

**SECTION 00440
OWNERSHIP STATEMENT**

Bidders shall be required to complete the Ownership Statement located under the Attributes tab within the solicitation at <https://burlcobids.ionwave.net>.

***** END OF SECTION 00440 – OWNERSHIP STATEMENT *****

**SECTION 00450
NON-COLLUSION CERTIFICATION**

STANDARD BID DOCUMENT REFERENCE	
	Reference: VII-H
Name of Form:	NON-COLLUSION AFFIDAVIT
Statutory Reference:	No specific statutory reference State Statutory Reference N.J.S.A. 52:34-15
Instructions Reference:	Statutory and Other Requirements VII-H
Description:	The Owner's use of this form is optional. It is used to ensure that the bidder has not participated in any collusion with any other bidder or Owner representative or otherwise taken any action in restraint of free and competitive bidding.

NON-COLLUSION AFFIDAVIT

State of New Jersey

County of _____

ss:

I, _____ residing in _____
(name of affiant) (name of municipality)
in the County of _____ and State of _____ of full age,
being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____
(title or position) (name of firm)

_____ the bidder making this Proposal for the bid

entitled _____, and that I executed the said proposal with
(title of bid proposal)

full authority to do so 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 above named project; and that all statements contained in said proposal and in this affidavit are true and correct, and made with full knowledge that the _____ relies upon
the truth of the statements contained in said Proposal

(name of contracting unit)

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

Subscribed and sworn to

before me this day

Signature

_____, 2 _____

(Type or print name of affiant under signature)

Notary public of

My Commission expires _____

(Seal)

*** END OF SECTION 00450 – NON-COLLUSION CERTIFICATION ***

SECTION 00460
QUALIFICATION QUESTIONNAIRE

Bidders shall be required to complete the Qualification Questionnaire located under the Attributes tab within the solicitation at <https://burlcobids.ionwave.net>.

***** END OF SECTION 00460 – QUALIFICATION QUESTIONNAIRE*****

SECTION 00470
FORM OF AGREEMENT
(To be executed at time of project award)

THIS AGREEMENT is made on the _____ day of _____, by and between _____, hereinafter called the CONTRACTOR and the Board of County Commissioners of Burlington County, New Jersey, hereinafter called the OWNER. The parties agree as follows:

ARTICLE I. Scope of Work

The Contractor shall furnish all labor, material, tools, machinery and appurtenances and perform all work called for under the Contract as indicated in contract drawings dated June 30, 2026 and June 29, 2026 OSK; and specifications dated **June 30, 2026 for Burlington County Agricultural Center- 2026 Improvements; 500 Centerton Road, Moorestown, NJ** herein after called the PROJECT as set forth herein to the satisfaction of the Owner.

ARTICLE II: Time of Completion

The work performed under the terms of this contract shall commence within fourteen (14) days upon the issuance of the Notice to Proceed and be completed no later than **120 days** after the Notice to Proceed, unless prevented by conditions over which the Contractor has no control, as agreed to, in writing, by the Owner and Architect.

ARTICLE III: The Contract Sum

The Owner shall pay to the Contractor for the satisfactory performance of the Contract the sum of _____ (\$ _____).

ARTICLE IV: Payment of the Contract Sum

The total sum of the Contract shall be paid for by the Owner as provided in Article 9 of the Burlington County General Conditions to the Construction Contract.

ARTICLE V: Contract Documents and Other Terms

The Contract shall include the Contract Documents (as defined in the Burlington County General Conditions, Section 00300); the schedule; all bidding documents, forms and instructions; the proposal for the work as submitted by the Contractor; the Contractor's bonds and insurance certificates, this Agreement and all written amendments and additions thereto all of which are incorporated herein by reference.

ARTICLE VI: Contract Wage Requirements

The minimum wage to be paid all labor employed on this contract shall be in accordance with the Section 00530 Prevailing Wage / Davis Bacon Rates / Listed Contractors and Subcontractors. The Contractor shall be bound by the most current State and Federal wage rate lists at the time of the signing of this Contract. Contractors or subcontractors shall keep full and accurate payroll records covering all disbursements of wages to their employees to whom they are required to pay not less than the prevailing rate or rates or wages. Such payroll records shall not be destroyed or removed from the State for the period of one (1) year following the completion of this improvement, final payment and guarantee period.

ARTICLE VII: Miscellaneous Terms

Upon failure to complete work within the schedule of time as adjusted by the Owner/Architect, the Contractor shall pay, as liquidated damages to the Owner (which amount is not a penalty) for each calendar day that the work remains unfinished, the sum of \$3,000.00 per calendar day. The Owner has retained a staff to perform the duties set forth in the Contract Documents on behalf of the Owner.

ARTICLE VIII: Hold Harmless

The Contractor shall indemnify and hold harmless the County for loss, damage, or injury from any act or omission of the Contractor, its employees or agents, and to the person or property of any other person or corporation while on or about the County's premises except such loss, damage or injury resulting solely from County's negligence.

Notwithstanding the foregoing paragraph, the Contractor shall not be responsible but County shall be responsible for damage to or destruction of buildings and personal property, the title to which is in County, resulting solely from perils covered under the County's fire and extended coverage insurance policies, and origination from any cause whatsoever, excluding the negligent acts or omissions of Contractor while lawfully on or about the premises of County.

The CONTRACTOR agrees to maintain Public Liability Insurance covering the obligations set forth herein, Workmen's Compensation insurance as required by law, covering all employees and all such coverage as required by Article II of the General and Supplementary Conditions of the Contract for Construction. All such insurance shall be evidenced by a certificate of Insurance executed by the CONTRACTOR'S insurance carrier(s) and filed with the COUNTY, specifically providing that the CONTRACTOR'S Public Liability insurance included contractual coverage covering this agreement, and further, that said insurance will not be cancelled or changed until at least thirty (30) days written notice has been given to COUNTY.

IN WITNESS WHEREOF, and intending to be legally bound, the parties have caused this Agreement to be executed by their duly authorized Officer and Director, respectively, attested by their duly authorized Secretary and Clerk/Administrator, respectively, and their respective corporate seals to be hereto affixed the day and year first written above. We have read and are in agreement with the above.

ATTEST:

	_____ (Contractor)
_____ (Witness)	_____ (Signature)
	_____ (Title / Date)
	BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF BURLINGTON
_____ (Witness)	_____ Eve A. Cullinan County Administrator
	_____ (Date)

*****END OF SECTION 00470-FORM OF AGREEMENT*****

SECTION 00480
PERFORMANCE AND PAYMENT BOND

BOND NO. _____

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

_____ as PRINCIPAL and with underwriting
offices at _____

_____ to which all communications in regard to
this bond should be addressed, a corporation organized and existing under the laws of the State of
_____ and duly authorized to do business in the State of New Jersey, as SURETY
are hereby held and firmly bound unto the BOARD OF COUNTY COMMISSIONERS OF THE COUNTY
OF BURLINGTON, NEW JERSEY, as OBLIGEE, in the penal sum of _____ - DOLLARS
(\$_____) 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 AND SEALED this _____ day of _____, two thousand and
_____ enter into a contract with the BOARD OF COUNTY COMMISSIONERS OF
THE COUNTY OF BURLINGTON identified as

_____ (CPU-_____)

which said contract is made part of this bond the same as though set forth herein;

NOW, if the Said principal shall well and faithfully do and perform the things agreed by PRINCIPAL to be
done and performed according to the terms of said contract, and shall pay all lawful claims of
beneficiaries as defined by N.J.S. 2A:44-143 for labor performed or materials, provisions, provender or
other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the
carrying forward, performing or completing of said contract, we agreeing and assenting that this
undertaking shall be for the benefit of any beneficiary as defined in N.J.S. 2LA:44-143 having a just claim
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 plans or specifications therefore shall in anywise affect the obligation of said surety of its bond.

Witness or Attest:	_____
_____	_____
_____ (Secretary)	_____ Principal
(ALSO PRINT OR TYPE NAME)	(ALSO PRINT OR TYPE NAME) (Affix Corporate Seal of Principal)

Witness or Attest:	_____
_____	_____
_____ (Secretary)	_____ Principal
(ALSO PRINT OR TYPE NAME)	(ALSO PRINT OR TYPE NAME) (Affix Corporate Seal of Surety) Surety Telephone Number _____

A certification of the authority of the Attorney-in-Fact committing the surety must be attached to this bond along with a true and correct statement of the financial condition of said surety.

*****END OF SECTION 00480 – PERFORMANCE BOND*****

SECTION 00490
DISCLOSURE STATEMENT AND CERTIFICATION

Bidders shall be required to complete the Disclosure Statement and Certification and submit it electronically under the Response Attachments Tab within the solicitation at <https://burlcobids.ionwave.net>.

DISCLOSURE STATEMENT AND CERTIFICATION

_____, Surety(ies) on the attached bond, hereby certified(y) the following:

(1) The surety meets the applicable capital and surplus requirements of R.S. 17: 17-6 or R.S. 17: 17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The Capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, _____ (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. section 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows: (indicate below for each surety the surety's underwriting limitation and the effective date thereof)

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriter limitation of that surety as established pursuant to R.S. 17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such, surety that surety's underwriting limitation and the date on which that limitation was established):

(4) The amount of the bond to which this statement and certification is attached is \$_____.

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above or both, then for each such contract or reinsurance:

(a) The name and address of each such reinsure under the contract and the amount of the reinsurer's participation in the contract is as follows:

 and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under items (5)(a) satisfies the credit for reinsurance requirement established under P.L. 1993, C.243 (.17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have filed with the appropriate agency.

CERTIFICATE

(To be completed by an authorized agent for each surety on the bond)

I, _____ (Name of Agent) _____
(title of Agent) for _____ (Name of Surety) a corporation /
mutual insurance company / other (indicating type of business organization) (circle one), domiciled in
_____ (state of Domicile) DO HEREBY CERTIFY that, to the
best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE, that if any
of those statements are false, this bond is VOIDABLE.

(Signature of Certifying Agent)

Printed Name of Certifying Agent

Title of Certifying Agent

***** END OF SECTION 00490 – DISCLOSURE STATEMENT*****

SECTION 00500
PUBLIC WORKS REGISTRATION

Bidders shall be required to submit electronically under the "Response Attachments" Tab within the solicitation at <https://burlcobids.ionwave.net>.

Contractors and the subcontractor(s) listed in the bid proposal must be registered pursuant to the Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq., with the New Jersey Department of Labor, Division of Wage & Hour Compliance, at the time the bid is opened. Failure of a contractor or a listed subcontractor to be registered at the time the bid is opened is a material deviation from specifications that cannot be cured after the bid has been opened; therefore, no award can be made to such a contractor. For more information regarding contractor registration, you may contact:

Contractor Registration Unit
Division of Wage and Hour Compliance
New Jersey Department of Labor
P.O. Box 389
Trenton, NJ 08625-0389
Telephone: (609) 292-9464
Fax: (609) 633-8591

Current Certificates of Registration issued by the New Jersey Department of Labor, Division of Wage and Hour Compliance for the contractor and the listed subcontractor(s) of the three apparent lowest bidders must be submitted to the Burlington County Purchasing Agent.

No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor or subcontractor is registered pursuant to the Public Works Contractor Registration Act

IMPORTANT NOTE: All Public Works Contractor Registration Certificates (PWCRC) shall be submitted by the deadline for bid submission. Contractors and the subcontractor(s) listed in the bid proposal must be registered pursuant to the Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq., with the New Jersey Department of Labor, Division of Wage & Hour Compliance, at the time the bid is opened. Failure of a contractor or a listed subcontractor to be registered at the time the bid is opened is a material deviation from specifications that cannot be cured after the bid has been opened; therefore, no award can be made to such a contractor.

*****END OF SECTION 00500 – PUBLIC WORKS REGISTRATION*****

SECTION 00510
FORM OF RELEASE OF LIENS- CONTRACTOR

(TO BE SUBMITTED BY THE CONTRACTOR AT THE TIME OF FINAL ACCEPTANCE:)

WHEREAS, pursuant to contract made on _____, 20____, BY AND BETWEEN THE COUNTY OF BURLINGTON, hereinafter called the Owner, and _____, hereinafter called the Contractor, final payment is about to be made.

NOW, THEREFORE, in consideration of the premises and the sum of _____ **(full contract amount paid to the Contractor and all major subcontractors)** of lawful money of the United States, being the full and entire sum due upon the completion of the contract aforesaid to the said contractor in hand paid by Owner, receipt to which is hereby acknowledged, said contractor does hereby remise, release and forever discharge the Owner of and from any and all manner of actions, suits, debts, dues, sums of money, accounts, reckoning, bonds, bills covenants, controversies, agreements, promises, claims and demands whatsoever in law or in equity which the said contractor has or may have for or on account of or in connection with the contract aforesaid.

The Contractor further agrees to indemnify and hold harmless the Owner from loss, expense, damage or injury as a result of claims arising out of or in connection with the execution of the work provided for in said contract including any claim made by any laborer, Contractor, or materialmen that may have furnished labor or material directly, or indirectly to the contractor or by reason of any action brought, or judgement recovered, by such laborer, contractor or materialmen.

IN WITNESS WHEREOF, the Contractor has caused its name to be hereunto subscribed and its seal to be hereunto affixed this _____ day of _____, Two Thousand and _____.

ATTEST:

(Contractor)

(Secretary)

(Signature)

SEAL

(Title / Date)

SECTION 00510
FORM OF RELEASE OF LIENS- SUBCONTRACTOR

(TO BE SUBMITTED BY EACH LISTED SUB- CONTRACTOR AT THE TIME OF FINAL ACCEPTANCE:)

WHEREAS, pursuant to contract made on _____, 200_, BY AND BETWEEN THE COUNTY OF BURLINGTON, hereinafter called the Owner, and _____, hereinafter called the Contractor, final payment is about to be made.

WHEREAS, pursuant to contract made on _____, 200_ BY AND BETWEEN THE CONTRACTOR, and _____, hereinafter called the Major Subcontractor for the _____ trade, final payment is about to be made by the Contractor to the Subcontractor.

NOW, THEREFORE, in consideration of the premises and the sum of _____ **(full contract amount paid to the listed subcontractor)** of lawful money of the United States, being the full and entire sum due upon the completion of the contract aforesaid to the said contractor in hand paid by Owner, receipt to which is hereby acknowledged, said subcontractor does hereby remise, release and forever discharge the Owner of and from any and all manner of actions, suites, debts, dues, sums of money, accounts, reckoning, bonds, bills covenants, controversies, agreements, promises, claims and demands whatsoever in law or in equity which the said subcontractor has or may have for or on account of or in connection with the contract aforesaid.

The Subcontractor further agrees to indemnify and hold harmless the Owner from loss, expense, damage or injury as a result of claims arising out of or in connection with the execution of the work provided for in said contract including any claim made by any laborer, contractor, or materialmen that may have furnished labor or material directly, or indirectly to the subcontractor or by reason of any action brought, or judgement recovered, by such laborer, subcontractor or materialmen.

IN WITNESS WHEREOF, the Subcontractor has caused its name to be hereunto subscribed and its seal to be hereunto affixed this _____ day of _____, Two Thousand and _____.

ATTEST:

(Subcontractor)

(Secretary)

(Signature)

SEAL

(Title / Date)

***** END OF SECTION 00510 - RELEASE OF LIEN FORM*****

SECTION 00520 AFFIRMATIVE ACTION

AFFIRMATIVE ACTION INSTRUCTIONS :

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:

(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 non-discrimination 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.
- (C) 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.
- (D) 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.
- (E) 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. 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 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.

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

Bidders may submit at copy of the form electronically under the Response Attachments Tab within the solicitation at <https://burlcobids.ionwave.net>.

*****END OF SECTION 00520 –AFFIRMATIVE ACTION****

SECTION 00530
PREVAILING WAGE / LISTED CONTRACTORS AND SUBCONTRACTORS

IT IS THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH THE MOST RECENT WAGE DETERMINATION FROM THE STATE OF NEW JERSEY DEPARTMENT OF LABOR. PRIOR TO THE START OF CONSTRUCTION THE CONTRACTOR MUST OBTAIN THE MOST RECENT, APPLICABLE LIST. INFORMATION OF PREVAILING WAGE RATES CAN BE FOUND AT <https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/>

SECTION 00540

BUSINESS REGISTRATION CERTIFICATE

STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE

N.J.S.A. 52:32-44 imposes certain requirements upon a business competing for or entering into a contract with Burlington County, a public contracting agency.

A Business Registration Certificate issued by the Division of Revenue in the New Jersey Department of the Treasury to a bidder for the contract must be submitted prior to the final award of contract to the successful bidder.

The submittal of a Business Registration Certificate is not required from a government agency or an organization organized as a nonprofit entity under 26 U.S.C. Section 501(c).

In addition to the Business Registration Certificate of the bidder, a Business Registration Certificate must be submitted prior to the final award of contract for each of the subcontractors named in the bid as required by N.J.S.A. 40A:11-16.

The contractor shall maintain and submit to the contracting agency a list of subcontractors and their addresses that may be updated from time to time during the course of the contract performance. A complete and accurate list shall be submitted before final payment is made for goods provided or services rendered or for construction of a construction project under the contract. The County shall not be responsible for a contractor's failure to comply with this paragraph.

For the term of this contract, the contractor and subcontractors, 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," P.L.1966, c.30 (C.54:32B-1 et seq.) on all their sales of tangible personal property delivered into this State. For the purposes of this paragraph, "affiliate" means any entity that (1) directly, indirectly, or constructively controls another entity, (2) is directly, indirectly, or constructively controlled by another entity, or (3) is subject to the control of a common entity. For purposes of this paragraph, an entity controls another entity if it owns, directly or individually, more than 50% of the ownership interest in that entity.

Applications for Business Registration Certificates can be submitted to the Division of Taxation, New Jersey Department of the Treasury at <http://www.state.nj.us/treasury/busregcert.htm>.

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration, 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 business registration copy not properly provided under a contract with a contracting agency.

Bidders shall, prior to award, be required to submit copies of certificates electronically under the Response Attachments Tab within the solicitation at <https://burlcobids.ionwave.net>.

*****End of Section 00540 – BUSINESS REGISTRATION CERTIFICATE*****

SECTION 00550

AMERICANS WITH DISABILITIES ACT

Equal Opportunity For Individuals With Disabilities.

The CONTRACTOR and the COUNTY do hereby agree that the provisions of Title II 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 thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the COUNTY 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 COUNTY in any action or administrative proceeding commenced pursuant to this Act. The CONTRACTOR shall indemnify, protect, and save harmless the COUNTY, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind of nature arising out of or claim 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 COUNTY'S grievance procedure, the CONTRACTOR agrees to abide by any decision of the COUNTY which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the COUNTY or if the COUNTY 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 COUNTY shall, as soon as possible after a claim has been made against it, give written notice thereof to the CONTRACTOR along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the COUNTY or any of its agents, servants, and employees, the COUNTY shall expeditiously forward or have forwarded to the CONTRACTOR every demand, complaint, notice, summons, pleading, or other process received by the COUNTY or its representatives.

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

It is further agreed and understood that the COUNTY 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 COUNTY from taking any other actions available to it under any other provisions of this Agreement or otherwise at law.

SECTION 00560 RESPONSIBLE CONTRACTOR POLICY

Bidder shall complete the Responsible Contractor and Subcontractor Policy Certification (Section 00560) and submit the Certification with the bid. Failure to submit the executed Certification with the bid is a material deviation and shall result in rejection of the bid. Bidders shall complete the Responsible Contractor and Subcontractor Policy Certifications and submit them under the Response Attachments tab within the solicitation at <https://burlcobids.ionwave.net/>.

The Subcontractors required to be listed in the bid by operation of N.J.S.A. 40A:11-16 * shall complete the Responsible Contractor and Subcontractor Policy Certification. The Bidder shall submit these executed Responsible Contractor and Subcontractor Policy Certifications with his bid. Failure to submit said executed Responsible Contractor and Subcontractor Policy Certifications with his bid is a material deviation and shall result in rejection of the bid.

All other Subcontractors hired by either 1) the Contractor or 2) the Subcontractors who are required to be listed by operation of N.J.S.A. 40A:11-16 shall complete a Responsible Contractor and Subcontractor Policy Certification and submit it to the Contractor before providing any work on the Project. The Contractor shall have the responsibility to collect the Responsible Contractor and Subcontractor Policy Certifications and to submit them to the Burlington County Purchasing Agent, 49 Rancocas Road, Mount Holly, New Jersey 08060. Failure of the Contractor to submit each Certification to the Purchasing Agent within ten days of receipt will be subject the Contractor to a penalty of five hundred dollars (\$500.00). Please see attached matrix for a complete listing of all penalties.

* The Subcontractors required to be listed in the bid by operation of N.J.S.A. 40A:11-16 are:

1. Plumbing
2. Heating, Ventilating, and Air Conditioning
3. Electrical
4. Structural Steel

***** END OF SECTION 00560 – RESPONSIBLE CONTRACTOR POLICY *****

BURLINGTON COUNTY
RESPONSIBLE CONTRACTOR AND SUBCONTRACTOR POLICY CERTIFICATION

Contract titled: **Burlington County Agricultural Center- 2026 Improvements (CPU-26-0051)**

I, _____, certify that the following statements made by me are true:
(name)

1. I am the _____ of _____ and as such have authority to
(title) (name of company)

to bind my firm to compliance with the Burlington County Responsible Contractor Policy and the Burlington County Responsible Subcontractor Policy.

2. My firm and all subcontractors hired by my firm providing work on this contract shall be responsible contractors or subcontractors with sufficient capabilities in all respects to successfully perform contracts on which they are engaged, including the necessary experience, equipment, technical skills and qualifications and organizational, financial and personnel resources. My firm has a satisfactory past performance record and a satisfactory record of law compliance, integrity and business ethics.

3. As a condition of performing work on public works contracts in excess of \$2,000.00 but less than \$499,999.00 total cost of project, my firm and each subcontractor hired by my firm when performing work on the project shall have at least one (1) employee who has successfully completed OSHA 10-hour construction safety and health course onsite. As a condition of performing work on public works contracts of \$500,000.00 or more total cost of project, my firm and each subcontractor when performing work on the project shall have at least one (1) employee who has successfully completed OSHA 30-hour construction safety and health course onsite.

4. Prior to the award of contract, I shall for my firm and for subcontractors hired by my firm that will perform significant work on this project provide evidence of and confirm compliance with proof of participation in an Apprenticeship Program currently registered and approved by the United States Department of Labor (USDOL) or the New Jersey Department of Labor or certify below a statement of agreement not to employ any worker of less than journeyman status on the project.

I certify that my firm will not employ any worker of less than journeyman status on the project.

(signature)

5. All Apprenticeship Programs shall meet the criteria set forth in Paragraph 6i below.

6. I further certify to the following facts regarding my firm's past performance and work history and its current qualifications and performance capabilities:

a. My firm has all valid, effective licenses, registrations or certificates required by federal, state, county, or local law, including, but not limited to, licenses, registrations, or certificates required to: (1) do business in the designated locale; and (2) perform the contract work it seeks to perform. These shall include, but not be limited to, licenses, registrations or certificates for any type of trade work or specialty work which the firm proposes to self-perform.

b. My firm meets the bonding requirements for the contract, as required by applicable law or contract specifications and any insurance requirements, as required by applicable law or contract specifications, including, but not limited to, general liability insurance, workers compensation insurance and unemployment insurance requirements.

c. My firm has not been debarred by any federal, state or local government agency or authority in the past three years.

d. My firm has not defaulted on any project in the past three years.

e. My firm has not had any type of business, contracting or trade license, registration, or other certification suspended or revoked in the past three years.

f. My firm has not been cited for a willful violation of federal or state safety laws in the past three years.

g. My firm and/or its owners have not been convicted of any crime relating to the contracting business by a final decision of a court or government agency in the past three years.

h. My firm will pay all craft employees that it employs on the project the current wage rates and benefits as required under applicable Federal or State prevailing wage laws.

i. My firm participates in an Apprenticeship Program that is currently registered with the United

States Department of Labor or a state apprenticeship agency for each craft or trade in which it hires apprentices.

Burlington County Agricultural Center- 2026
Improvements CPU-26-0051
500 Centerton Road
Moorestown, NJ 08057
June 30, 2026

RESPONSIBLE CONTRACTOR POLICY

Proof of this participation is attached to this Certification. My firm shall continue to participate in applicable apprenticeship programs for the full duration of the contract work.

The Apprenticeship Program in which my firm participates meets the following criteria:

- 1) The program has graduated at least one (1) enrollee in each of the past three years. If the Program has not been in existence for three years, this requirement shall not apply until the Program has been in existence for three years. At that time, compliance with this criteria is required.
- 2) The program has graduated at least seventy-five (75) percent of program enrollees in each of the past three years.*

* Graduation rates for any particular year shall be calculated based on the number of enrollees who graduated in a given year divided by the total number of enrollees (and former enrollees) who could have been eligible to graduate in that year had they remained enrolled and timely completed the program. The term "total number of enrollees" shall be computed by counting the total number of persons enrolled in approved Apprenticeship Programs for each separate trade or craft approved by the State of New Jersey. For example, the total number of enrollees in the electrical trade would consist of all persons currently enrolled in an approved Apprenticeship Program for electricians in the State of New Jersey. If the New Jersey based trade or craft, conducts education classes outside the State, those attendees shall count as enrollees for purposes of this subparagraph. Enrollees who withdraw for reasons of military service, residence relocation, death, sickness, or hardship as approved by the teaching staff shall not be counted as enrollees for the purposes of calculating the graduation rate.

j. All workers and employees hired by my firm is provided with health and hospital insurance plans and an ERISA compliant retirement plan to its employees.

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

(signature)

(print name)

(title)

SECTION 00570
PROJECT LABOR AGREEMENT

This project shall be governed by the attached Project Labor Agreement(s) as approved and resolved by the Board of Commissioners of the County of Burlington. It is MANDATORY that Bidders include copies of completed and signed Letter of Assent(s) for the Project Labor Agreement(s) included in the specifications with their bid submissions. THE LETTER OF ASSENT(S) MUST BE COMPLETED, SIGNED, AND INCLUDED WITH YOUR BID SUBMISSION. Failure to complete this section of the bid will result in REJECTION of your bid.

Bidders shall be required to submit copies of completed and signed Letter of Assent(s) the Project Labor Agreement(s) included in the specifications. The Letter of Assent(s) shall be submitted electronically under the Response Attachments Tab within the solicitation at <https://burlcobids.ionwave.net>.

PROJECT LABOR AGREEMENT
COVERING BURLINGTON COUNTY AGRICULTURAL CENTER 2026
IMPROVEMENTS PROJECT IN BURLINGTON COUNTY, NEW JERSEY

CONTRACT NO. CPU-26-0051

ARTICLE 1 - PREAMBLE

WHEREAS, the County of Burlington, (hereinafter “County”), on behalf of itself as Owner, and the United Building Trades Council of Southern New Jersey, on behalf of itself, desire to provide for the efficient, safe, quality, and timely completion of the Burlington County Agricultural Center 2026 Improvements Project, Contract No. CPU-26-0051 in a manner designed to afford lower reasonable costs to the County, the Owner, and the Public who it represents, and the advancement of public policy objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia by:

- (1) ensuring a reliable source of skilled and experienced labor;
- (2) standardizing the terms and conditions governing the employment of labor on the Project;
- (3) permitting wide flexibility in work scheduling and shift hours and times; from those which otherwise might obtain;
- (4) receiving negotiated adjustments as to work rules and staffing requirements from those which otherwise might obtain;
- (5) providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;
- (6) avoiding the costly delays of potential strikes, slowdowns,
- (7) walkouts, picketing and other disruptions arising from work disputes, and promote labor harmony and peace for the duration of the Project.
- (8) furthering public policy objectives as to improved employment
- (9) opportunities for minorities, women and the economically disadvantaged in the construction industry;
- (10) expediting the construction process;

and, **WHEREAS**, the signatory Unions desire the stability, security and work opportunities afforded by a Project Labor Agreement;

and **WHEREAS**, the Parties desire to maximize Project safety conditions for both workers and the public,

NOW, THEREFORE, the Parties enter into this Agreement:

SECTION 1. PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by and between Burlington County and the United Building Trades Council of Southern New Jersey, for the construction work of the Burlington County Agricultural Center 2026 Improvements Project, Contract No. CPU-26-0051, to be performed on the property of the County, in the State of New Jersey, and by the United Building Trades Council of Southern New Jersey, on behalf of itself and its affiliates and the members and the signatory Local Unions, on behalf of themselves and their members.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1. DEFINITIONS

Throughout this Agreement, the Union party and the Building Trades Council are referred to singularly and collectively as "the Union(s)" where specific reference is made to "Local Unions" that phrase is sometimes used; the term "Contractor(s)" shall include the General Contractor (GC), and all signatory contractors, and their subcontractors of whatever tier, engaged in on-site Project construction work within the scope of this Agreement as defined in Article III; Burlington County is referenced as Owner; the United Building Trades Council of Southern New Jersey is referenced as the "BTC", and the work covered by this Agreement (as defined in Article III). is referred to as the "Project".

SECTION 2. CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

The Agreement shall not become effective unless executed by the BTC and Burlington County, and will remain in effect until the completion of the Project.

SECTION 3. ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all signatory Unions and the General Contractor and all signatory Contractors performing on-site Project work, including site preparation and staging areas, as defined in Article 3. The Contractors shall include in any subcontract that they let, for performance during the term of this Agreement, a requirement that their subcontractors, of whatever tier, become signatory and bound by this Agreement with respect to subcontracted work performed within the scope of Article 3 and execute the Letter of Assent attached as Schedule B.

This Agreement shall be administered by the GC on behalf of all Contractors. The BTC warrants that it is authorized to execute this Agreement on behalf of all the Unions noted in Exhibit A.

SECTION 4. SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto as Schedule A represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other collective bargaining agreement of any type which would otherwise apply to this Project, in whole or in part, except for all work performed under the NTD Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, all instrument calibration work and loop checking shall be performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors, with the exception of Article VII, IX and X of this Project Agreement, which shall apply to such work. Where a subject covered by the provisions, explicit or implicit, of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall prevail. It is further understood that neither the GC nor any Contractor shall be required to sign any other agreement as a condition of performing work on this Project. No practice, understanding or agreement between a Contractor and Local Union, which is not explicitly set forth in this Agreement shall be binding on this Project unless endorsed in writing by the GC.

SECTION 5. LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The GC and any Contractor shall not be liable for any violations of this Agreement by any other Contractor, and the BTC and Local Unions shall not be liable for any violations of this Agreement by any other Union.

SECTION 6. THE GENERAL CONTRACTOR

The Owner and the GC shall require in its bid specifications for all work within the scope of Article 3 that all successful bidders, and their subcontractors of whatever tier, become bound by, and signatory to, this Agreement. The County of Burlington is not a party to and shall not be liable in any manner under this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the County in determining which Contractors shall be awarded contracts for Project work. It is further understood that the County has sole discretion at any time to terminate, delay or suspend the work, in whole or part, on this Project.

SECTION 7. AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Unions agree that this Agreement will be made available to, and will fully apply to any successful bidder for Project work who becomes signatory thereto, without regard to whether that successful bidder performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder are, or are not, members of any unions. This Agreement shall not apply to the work of any Contractor or GC, which is performed at any location other than a Project site, as defined in Article 3, Section 1.

SECTION 8. SECURITY MONITORING

The parties agree that all communication by the parties with any media sources regarding the Project must be done only by the Owner.

The parties agree and consent to the Contractors' implementation and use of a security badging system.

Finally, the parties agree and consent to the Contractors' implementation of Security checkpoints at the entrances to and exits from the Project Site, at which Project Security personnel will randomly inspect the containers, apparel, vehicles and other personal belongings of employees who enter and exit the Project Site to deter theft. Employees who refuse to submit to an inspection of their containers, apparel, vehicles and other personal belongings will be prohibited from re-entering the Project Site. The parties agree and consent to implement and cooperate with any other Project Site security requirements imposed by the Owner, which shall be disclosed to the County Council in advance of the pre-job meeting.

ARTICLE 3 - SCOPE OF THE AGREEMENT

The Project work covered by this Agreement shall be as defined and limited by the following sections of this Article.

SECTION 1: THE WORK

This Agreement shall apply to all on-site public construction work, including site preparation, demolition and hazardous waste remediation, for the above-referenced Project in the State of New Jersey, and in the County of Burlington, as is further delineated in the scope of final contract documents.

The scope of work is confined to the on-site Project work contained in the scope of the final construction contract of the General Contractor. The scope of Project work may be amended

from time to time by the Owner's Representative to include work not performed under the above description.

The parties hereby agree that all Tele-data work and associated electrical work performed on any of the sites during construction shall be done by employees represented by the signatory unions. For the purpose of this Agreement, Tele-data work shall include, but not limited to, the following: All receiving, placement, installation, operation, testing, inspection, maintenance, repair and service of radio, television, video, data, voice, sound, emergency call, microwave and visual production and reproduction apparatus, equipment and appliances used for domestic, commercial, education and entertainment purposes; all installation and erection of equipment, apparatus or appliance, cables and/or wire, emergency power (batteries) and all directly related work which becomes an integral part of the telecommunication and/or telecommunications related systems repair and service maintenance work of telecommunications systems and devices including, but not limited to, Private Branch Exchanges (PBX-PABX), Key equipment-owned, CCTV, CATV, card access, Systems RS 232 ethernet and/or any local area network system associated with computer installation.

SECTION 2. EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing work on the Project:

- a. Superintendents, supervisors (excluding superintendents and general supervisors and forepersons specifically covered by a craft's Schedule A), engineers, inspectors and testers (excluding divers specifically covered by a craft's Schedule A), quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, non-manual employees, and all professional, engineering, administrative and management persons;
- b. Employees of Owner or any State agency, authority or entity or employees of any municipality or other public employer;
- c. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery, unless such offsite operations are covered by the New Jersey Prevailing Wage Act (for example, by being dedicated exclusively to the performance of the public works contract or

building project and are adjacent to the site of work), or involved in deliveries to and from the Project site, excepting local deliveries of all major construction materials including fill, ready mix, concrete and cement, asphalt and other items which are covered by this Agreement. Provided, however, local deliveries of ready mix, concrete, cement and asphalt shall not be contracted except to a subcontractor who pays wages and benefits not less than the economic equivalent of the wages and benefits set forth in Exhibit A.

- d. Employees of the GC, excepting those performing manual, on-site construction labor who will be covered by this Agreement;
- e. Employees engaged in on-site equipment warranty.
- f. Employees engaged in geophysical testing (whether land or water) other than boring for core samples;
- g. Employees engaged in laboratory or specialty testing or inspections;
- h. Employees engaged in ancillary Project work performed by third parties such as electric utilities, gas utilities, telephone utility companies, and railroads.

SECTION 3. NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to the parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractor or of the GC , which do not perform work at this Project. It is agreed, for the purposes of this Agreement only, that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the Owner, the GC and/or any Contractor. The Agreement shall further not apply to the Owner or any other state or county agency, authority, or other municipal or public entity and nothing contained herein shall be construed to prohibit or restrict the Owner or its employees of any other state authority, agency or entity and its employees from performing on or off-site work related to the Project. As the contracts which comprise the Project work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty work are assigned in writing (copy to Local Union involved) by the General Contractor for performance under the terms of this Agreement.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 1. PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all craft employees who are performing on-site Project work within the scope of this Agreement as defined in Article 3.

SECTION 2. UNION REFERRAL

A. The Contractors agree to hire Project, craft employees covered by this Agreement through the job referral systems and hiring halls (where the referrals meet the qualifications set forth in items 1, 2, and 4 subparagraph B) established in the Local Unions' area collective bargaining agreements (attached as Schedule A to this Agreement), subject to the goals of any applicable local ordinances or agreements pertaining to hiring and apprenticeship goals for minorities, women, residents of disadvantaged communities, and local residents... Notwithstanding this, the Contractors shall have sole rights to determine the competency of all referrals; the number of employees required (except with regard to piledriving and cranes); the selection of employees to be laid-off (subject to the applicable procedures in Schedule A for permanent and/or temporary layoffs and except as provided in Article 5, Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments required in the applicable Schedule A. In the event that a Local Union is unable to fill any request for qualified employees within a 48-hour period after such requisition is made by the Contractor (Saturdays, Sundays, and holidays excepted), the Contractor may employ qualified applicants from another competent source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of the Project, craft employees hired within its jurisdiction from any source other than referral by the Union.

B. A Contractor may request by name, and the Local will honor, referral of persons who have applied to the Local for Project work and who meet the following qualifications as determined by a Committee of 3 designated, respectively, by the applicable Local Union, the GC and a mutually selected third party or, in the absence of agreement, the permanent arbitrator (or designee) designated in Article 7:

- (1) possess any license required by NJ law for the Project work to be performed;
- (2) have worked a total of at least 1000 hours in the Construction craft during the prior 3 years;
- (3) were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award;
- (4) have demonstrated ability to safely perform the basic function of the applicable trade.

Following the employment of the first employee in each craft under Schedule A or the procedure set forth above in paragraph A, no more than 12 (12%) per centum of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above which, consistent with N.J.S.A. 52:38-4, permit contractors and subcontractors working on the public works project to retain a percentage of their current workforce (any fraction shall be rounded to the next highest whole number).

C. A certified MBE/WBE contractor may request from the Workforce Coordinator, through the GC, an exception to, and waiver of, the above per centum limitation upon the number of its employees to be hired through the special provision of Section 2.B above. This exception is based upon hardship and demonstration by the contractor that the Project work would be the contractor's only job and that it would be obliged to lay off qualified minority and female employees in its current workforce moving from the last job. The exception and waiver are also conditioned upon the employees meeting the qualifications as set forth in Section 2.B above.

SECTION 3. NON-DISCRIMINATION IN REFERRALS

The Unions represent that their hiring halls and referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations, which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4. WORKFORCE DIVERSITY

To the extent applicable, the parties hereby agree that each will implement and abide by the requirements of the Owner with regard to workforce diversity. Furthermore, the General Contractor, Contractors and the Unions will comply with such affirmative action plan, including but not limited to: (1) the parties will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, sex or any other protected category used by government regulation; (2) the parties will endeavor to include in any solicitations or advertisements for employees or subcontractors, a notice that all qualified applicants will receive consideration for employment, and contractors and subcontractors for work, without regard to age, race, creed, color, national origin, ancestry, marital status, sex or any other protected category used by government regulation; and (3) the parties agree to utilize the best efforts to ensure that minority business enterprises and women-owned business enterprises shall have the maximum practicable opportunity to provide Construction Work under this Agreement.

The Local Unions agree and support the importance the Owner places on having and maintaining a diverse workforce. The Unions agree to refer any and all Burlington County resident journeymen and apprentices who are registered on the Out-of-Work list of the local union referral systems at the time of a contractor's request. The Local Unions will cooperate with Contractor requests for Burlington County residents, residents of disadvantaged communities, minority, or women referrals to meet the requirements of the Owner.

In the event a Union either fails, or is unable, to refer qualified minority or female applicants in percentages equaling Project affirmative action goals as set forth in the Owners bid specifications, the Contractor may employ qualified minority or female applicants from any other available source as Apprentice Equivalents. Apprentice Equivalents will have completed a DOL approved training program, applied to take a construction Apprenticeship test, and will be paid at not less than the applicable equivalent Apprentice rate. With the approval of the Local Administrative Committee (LAC), experience in construction related areas may be accepted as meeting the above requirements.

SECTION 5. CROSS AND QUALIFIED REFERRALS

The Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts

to recruit sufficient numbers of skilled and qualified craft employees to fulfill the requirements of the Contractor.

SECTION 6. UNION DUES / WORKING ASSESSMENTS

The union security provisions contained in the applicable Schedule A local agreements, shall not apply to the employees covered by this Agreement as for the period of time during which they are performing on-site Project work. No employee shall be discriminated against at the Project site because of the employee's union membership or lack thereof. In the case of unaffiliated employees who have voluntarily executed dues checkoff authorization cards provided Schedule A local agreement, the dues payment can be received by the Unions as a working assessment fee.

SECTION 7. CRAFT FOREPERSONS AND GENERAL FOREPERSONS

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule A. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft foreperson shall be designated as working forepersons at the request of the Contractor, except when an existing local Collective Bargaining Agreement prohibits a foreperson from working when the craftsperson he is leading exceed a specified number.

ARTICLE 5 - UNION REPRESENTATION

SECTION 1. LOCAL UNION REPRESENTATIVE

Each Local Union representing on-site Project employees shall be entitled to designate in writing (copy to General Contractor involved) representatives, including the Business Manager, who shall be afforded access to the Project.

SECTION 2. STEWARDS

(a) Each Local Union shall have the right to designate a working journey person as a Steward and an alternate, and shall notify the Contractor and GC of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. There will be no non-working Stewards on the Project.

(b) In addition to their work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's

Contractor and, if applicable, subcontractors of that Contractor, but not with the employees of any other Contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.

(c) The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime, except pursuant to a Schedule A provision providing procedures for the equitable distribution of overtime.

SECTION 3. LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 - MANAGEMENT'S RIGHTS

SECTION 1. RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their Project operations including, but not limited to: the right to direct the work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; or the discipline or discharge for just cause of its employees; the assignment and schedule of work; the promulgation of reasonable Project work rules; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices, which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, GC, and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2. MATERIALS, METHODS & EQUIPMENT

There shall be no limitations or restrictions upon the contractors' choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials, tool, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work;

provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-out or testing of specialized or unusual equipment or facilities as designated by the Contractor. Notwithstanding the foregoing statement of contractor rights, prefabrication issues relating to work traditionally performed at the job site shall be governed pursuant to the terms of the applicable Schedule A. There shall be no restrictions as to work, which is performed off-site for the Project, except for 1) offsite operations work covered under the New Jersey Prevailing Wage Act or 2) done in a fabrication center, tool yard, or batch plant dedicated exclusively to the performance of work on the Project, and located adjacent to the "site of work". Where available locally offsite operations work covered under the New Jersey Prevailing Wage Act shall be performed within the territorial jurisdiction of the local unions signatory to this Agreement.

General Contractor agrees that when subcontracting for prefabrication of H.V.A.C. duct and other related sheet metal, such prefabrication shall be subcontracted to fabricators who pay their employees engaged in such fabrication not less than the prevailing wage for comparable sheet metal fabrication as established under agreements between local affiliates of Sheet Metal Workers' International Association and local sheet metal fabricators.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 1. NO STRIKES-NO LOCKOUT

There shall not be strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Project for any reason by any Union or employee against any Contractor or employer while performing work at the Project. There shall be no other Union, or concerted or employee activity which disrupts or interferes with the operation of the existing free flow of traffic in the project area. Failure of any Union or employee to cross any picket line established by any union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to the Project site is a violation of this Article. There shall be no lockout at the Project by any signatory Contractor. Contractors and Unions shall take all steps necessary to ensure compliance with this Section 1 and to ensure uninterrupted construction and the free flow of traffic in the project area for the duration of this Agreement.

SECTION 2. DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3. NOTIFICATION

If a Contractor contends that any Union has violated this Article, it will notify the appropriate district or area council of the Local Union involved advising of such fact, with copies of the notification to the Local Union and the BTC. The district or area council, and the BTC shall each instruct, order and otherwise use their best efforts to cause the employees, and/or the Local Unions to immediately cease and desist from any violation of this Article. A district or area council, or the BTC complying with these obligations shall not be liable for the unauthorized acts of a Local Union or its members.

SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

- a. A party invoking this procedure shall notify J.J. Pierson Jr, Esq., at 51 JFK Parkway, First Floor West, Short Hills, New Jersey 07078, telephone number (973) 359-8100, fax number (973) 359-8161, or e-mail jjpgierson@jjpgierson.com, who shall serve as Arbitrator under this expedited arbitration procedure. In the event that J.J. Pierson is unable to serve, a party invoking this procedure shall notify Louis Verrone, who shall serve as arbitrator under this expedited procedure. Copies of such notification will be simultaneously sent to the alleged violator and, if a Local Union is alleged to be in violation, it's International, the Owner, the GC, and the BTC.
- b. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the GC, the Local Union involved, and the BTC, hold a hearing within 48 hours of receipt of the notice invoking the procedure it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice to the district or area council required by Section 3 above. Hearings shall be held at the jobsite or at the

office of the New Jersey State Board of Mediation, or as directed by the Arbitrator.

- c. All notices pursuant to this Article may be by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the arbitrator, Contractor or Union involved. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.
- d. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for court proceedings, if any. The Award shall be issued in writing within 3 hours after the close of the hearing and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.
- e. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of the Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved. In any court proceeding to obtain a temporary or preliminary order enforcing the arbitrator's Award as issued under this expedited procedure, the involved Union and Contractor waive their right to a hearing and agree that such proceedings may be ex parte, provided notice is given to opposing counsel. Such agreement does not

waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

- f. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.
- g. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8. - LOCAL ADMINISTRATIVE COMMITTEE (LAC)

SECTION 1. MEETINGS

The Local Administrative Committee (LAC) will meet on a regular basis to 1) Implement and oversee the Agreement procedures and initiatives; 2) monitor the effectiveness of the Agreement; and 3) identify opportunities to improve efficiency and work execution.

Each Contractor, upon Award of a Contract by the Owner's Representative to perform work at the Project and prior to commencing work, shall:

- A. Notify the BTC at (609) 704-8351 of the Contract Award.
- B. Through the BTC, coordinate a pre-job conference meeting with the signatory Unions and the Owner's Representative. The purpose of the meeting will be to discuss in detail the scope of the work to be performed and conduct a jurisdictional "mark-up" meeting.

Labor/Management meetings among the Owner's Representative, the appropriate Contractors and sub-Contractors, the BTC, and signatory Unions will be held on a quarterly basis, or more or less frequently upon the agreement of the parties. All appropriate Contractors, sub-Contractors, and Unions will be expected to be in attendance. The purpose of the meetings shall be to keep all parties fully apprised of the Project's progress, schedule, manpower requirements,

safety and labor relations issues, and to generally promote labor-management harmony and cooperation.

SECTION 2. COMPOSITION

The LAC will be co-chaired by the President of the United Building and Construction Trades Council of Central Jersey or his designee, and designated official of the GC. It will be comprised of representatives of the local unions signatory to the project labor agreement (PLA) and representatives of the GC and other contractors on the project.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

Step 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor. To be timely, such notice of the grievance must be given within 7 calendar days after the act, occurrence, or event giving rise to the grievance, or after the act, occurrence or event became known or should have become known to the Union. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 7 calendar days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of they grievance procedure by serving the involved Contractor and the General Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved, unless the settlement is accepted in writing, by the General Contractor, as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

The Business Manager or designee of the involved Local Union, together with representatives of the BTC, the involved Contractor, and the General Contractor shall meet in Step 2 within 5 calendar days of the written grievance to arrive at a satisfactory settlement.

Step 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 14 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to the next available arbitrator of the panel of arbitrators consisting of J.J. Pierson Jr., Esq., Louis Verrone and Wellington Davis, who shall serve as arbitrator under this expedited procedure. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. Hearings shall be held at the jobsite or at the Newark office of the New Jersey State Board of Mediation, as directed by the Arbitrator.

The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitration's shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the GC, involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2. LIMITATION AS TO RETROACTIVITY

No arbitration decision or award may provide retroactivity of any kind exceeding 30 calendar days prior to the date of service of the written grievance on the construction Project Manager and the involved Contractor or Local Union.

SECTION 3. PARTICIPATION BY GENERAL CONTRACTOR

The General Contractor shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these Steps, including Step 3 arbitration.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1. NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2. ASSIGNMENT

A. There shall be a mandatory pre-job markup / assignment meeting prior to the commencement of any work. Attending such meeting shall be designated representatives of the Union signatories to this Agreement, the GC, and the involved Contractors. Best efforts will be made to schedule the pre-job meeting in a timely manner after Notice to Proceed is issued but not later than 30 days prior to the start of the Project.

B. All Project construction work assignments shall be made by the Contractor according to criteria set forth in Section 3, Subsection D 1-3.

C. When a Contractor has made an assignment of work, he shall continue the assignment without alteration unless otherwise directed by an arbitrator or there is agreement between the National or International Unions involved. Claims of a change of original assignment shall be processed in accordance with Article I of the Procedural Rules of the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry ("the Plan").

D. In the event that a Union involved in the change of original assignment dispute is an affiliate of a National or International Union that is not affiliated with the Building and Construction Trades Department and does not wish to process a case through the Plan, the parties shall mutually select one of the following Arbitrators: Arbitrator J.J. Pierson, Arbitrator Paul Greenberg or Arbitrator Richard K. Hanft and submit the dispute directly to the Arbitrator. The selected Arbitrator shall determine whether the case requires a hearing or may be decided upon written submissions. In rendering his determination on whether there has been a change of original assignment, the Arbitrator shall be governed by the following:

1. The contractor who has the responsibility for the performance and installation shall make a specific assignment of the work which is included in his contract to a particular union(s). For instance, if contractor A subcontracts certain work to contractor B, then contractor B shall have the responsibility for making the specific assignments for the work included in his contract. If contractor B, in turn, shall subcontract certain work to contractor C, then contractor C shall have the responsibility for making the specific assignment for the work included in his contract. After work has been so assigned, such assignment will be maintained even though the assigning contractor is replaced and such work is subcontracted to another contractor. It is a violation of the Agreement for the contractor to hold up disputed work or shut down a project because of a jurisdictional dispute.

2. When a contractor has made an assignment of work, he shall continue the assignment without alteration unless otherwise directed by an arbitrator or there is agreement between the National or International Unions involved.

a. Unloading and/or handling of materials to stockpile or storage by a trade for the convenience of the responsible contractor when his employees are not on the job site, or in an emergency situation, shall not be considered to be an original assignment to that trade.

b. Starting of work by a trade without a specific assignment by an authorized representative of the responsible contractor shall not be considered an original assignment to that trade, provided that the responsible contractor, or his authorized representative, promptly, and, in any event, within eight working hours following the start of work, takes positive steps to stop further unauthorized performance of the work by that trade.

SECTION 3. PROCEDURE FOR SETTLEMENT OF DISPUTES

A. Any Union having a jurisdictional dispute with respect to Project work assigned to another Union will submit through its International the dispute in writing to the Administrator of the Plan within 72 hours and send a copy of the letter to the other Union involved, the Contractor involved, the General Contractor, the BTC, and the district or area councils of the unions involved. Upon receipt of a dispute letter from any Union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Procedural Rules of the Plan.

B. Within 5 calendar days of receipt of the dispute letter, there shall be a meeting of the General Contractor, the Contractor involved, the Local Unions involved and designees of the

BTC and the district or area councils of the Local Unions involved for the purpose of resolving the jurisdictional dispute.

C. In order to expedite the resolution of jurisdictional disputes, the parties have agreed in advance to mutually select one of the following designated Arbitrators: Arbitrator J.J. Pierson, Arbitrator Paul Greenberg or Arbitrator Richard K. Hanft to hear all unresolved jurisdictional disputes arising under this Agreement. All other rules and procedures of the Plan shall be followed. If none of the three Arbitrators is available to hear the dispute within the time limits of the Plan, the Plan's arbitrator selection process shall be utilized to select another arbitrator.

D. In the event that a Union involved in the dispute is an affiliate of a National or International Union that is not affiliated with the Building and Construction Trades Department and does not wish to process a case through the Plan as described in paragraphs A-C above, the parties to the dispute shall mutually select one of the following Arbitrators: Arbitrator J. J. Pierson, Arbitrator Paul Greenberg or Arbitrator Richard K. Hanft to hear the dispute and shall submit the dispute directly to the selected arbitrator. The time limits for submission and processing disputes shall be the same as provided elsewhere in this Section. The selected Arbitrator shall schedule the hearing within seven business days from the date of submission. If he cannot hear the case within the required timeframe, one of the other Arbitrators will be selected to hear the case unless all parties to the dispute agree to waive the seven day time limit. In rendering his decision, the Arbitrator shall determine:

1. First whether a previous agreement of record or applicable agreement, including a disclaimer agreement, between the National and International Unions to the dispute governs;

2. Only if the Arbitrator finds that the dispute is not covered by an appropriate or applicable agreement of record or agreement between the crafts to the dispute, he shall then consider the established trade practice in the industry and prevailing practice in the locality where there is a previous decision of record governing the case, the Arbitrator shall give equal weight to such decision of record, unless the prevailing practice in the locality in the past ten years favors one craft. In that case, the Arbitrator shall base his decision on the prevailing practice in the locality. Except, that if the Arbitrator finds that a craft has improperly obtained the prevailing practice in the locality through raiding, the undercutting of wages or by the use of vertical agreements, the Arbitrator shall rely on the decision of record and established trade practice in the

industry rather than the prevailing practice in the locality.

3. Only if none of the above criteria is found to exist, the Arbitrator shall then consider that because efficiency, cost or continuity and good management are essential to the wellbeing of the industry, the interests of the consumer or the past practices of the employer shall not be ignored.

The Arbitrator shall set forth the basis for his decision and shall explain his findings regarding the applicability of the above criteria. If lower-ranked criteria are relied upon, the Arbitrator shall explain why the higher-ranked criteria were not deemed applicable. The Arbitrator's decision shall only apply to the job in dispute.

Each party to the arbitration shall bear its own expense for the arbitration and agrees that the fees and expenses of the Arbitrator shall be borne by the losing party or parties as determined by the Arbitrator.

E. The Arbitrator shall render a short-form decision within 5 days of the hearing based upon the evidence submitted at the hearing, with a written decision to follow within 30 days of the close of hearing.

F. This Jurisdictional Dispute Resolution Procedure will only apply to work performed by Local Unions that represent workers employed on the Project.

G. Any Local Union involved in a jurisdictional dispute on this Project shall continue working in accordance with Section 2 above and without disruption of any kind.

SECTION 4. AWARD

Any award rendered pursuant to this Article and the Plan shall be final and binding on the disputing Local Unions and the involved Constructor on this Project only and may be enforced in accordance with the provisions of Article VII of the Plan. Any award rendered pursuant to the alternate procedures of this Article shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in any court of competent jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement. In all disputes under this Article, the General Contractor and the involved Contractors shall be considered parties in interest.

SECTION 5. LIMITATIONS

The Arbitrator shall have no authority to assign work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the work involved; nor to

assign work to employees who are not qualified to perform the work involved; nor to assign work being performed by non-union employees to union employees. This does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than 1 employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed work belongs.

SECTION 6. NO INTERFERENCE WITH WORK

A. There shall be no interference or interruption of any kind with the work of the Project while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award. Any claims of a violation of this section shall be submitted and processed in accordance with the impediment to job progress provisions of the Plan.

B. In the event a Union alleged to have engaged in an impediment to job progress is an affiliate of a National or International Union that is not affiliated with the Building and Construction Trades Department and does not wish to have the impediment to job progress charge processed through the Plan, the parties to the dispute shall mutually select one of the three Arbitrators designated in this Article to hear the dispute. The selected Arbitrator shall schedule the hearing within two business days from the date of submission. If he cannot hear the case within the required timeframe, one of the other Arbitrators shall be selected by the parties to hear the case unless all parties to the dispute agree to waive the two day time limit. The sole issue at the hearing shall be whether or not a violation of this Section has in fact occurred, and the Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages. The Arbitrator's decision shall be issued in writing within 3 hours after the close of the hearing and may be issued without an opinion. If any party desires an opinion, one shall be issued within 15 days, but its issuance shall not delay compliance with, or enforcement of, the decision. The Arbitrator may order cessation of the violation of this Section and other appropriate relief, and such decision shall be served on all parties by facsimile upon issuance. Each party to the arbitration shall bear its own expense for the arbitration and agrees that the fees and expenses of the Arbitrator shall be borne by the losing party or parties as determined by the Arbitrator.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1. CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the base hourly wage rates for those classifications as specified in the attached Schedules A, as amended during this Agreement. Recognizing, however, that special conditions may exist or occur on the Project, the parties, by mutual agreement may establish rates and/or hours for one or more classifications, which may differ from Schedules A. Parties to such agreements shall be the General Contractor, the Contractor involved, the involved Local Unions and the BTC.

SECTION 2. EMPLOYEE BENEFIT FUNDS

A. The Contractors agree to pay contributions on behalf of all employees covered by this Agreement to the established employee benefit funds in the amounts designated in the appropriate Schedule A. Bona fide jointly trusted fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added. However, if a defined benefit pension fund covered by the terms and conditions of this Agreement has not adopted the building and construction industry exemption authorized by subsection (b) of Section 4203 of the Employee Retirement Income Security Act of 1974, the Contractor shall not be obligated to hire employees covered by that fund.

Any Contractor who is already participating in and contributing to the Teamsters Local Pension Plan, separately from this Project Labor Agreement, shall pay contributions as provided for in Article 11, Section 2, paragraph 1, of this Project Labor Agreement.

B. The Contractor agrees to be bound by the written terms of the legally established Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to work done on this Project and only for those employees to whom this Agreement requires such benefit Payments.

C. Should any contractor or sub-contractor become delinquent in the payment of contributions to the fringe benefit funds, then the subcontractor at the next higher tier, or upon notice of the delinquency claim from the Union or the Funds, agrees to withhold from the subcontractor such disputed amount from the next advance, or installment payment for work performed and the amount claimed and owed will be paid within thirty (30) days after receipt of

the notification by the General Contractor, if not paid prior to said date by the delinquent contractor/subcontractor.

ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1. WORK WEEK AND WORK DAY

A. The standard work week shall consist of 40 hours of work at straight time rates per one of the following schedules:

1) Five-Day Work Week: Monday-Friday, 5 days, 8 hours plus 1/2 hour unpaid lunch period each day.

2) Four-Day Work Week: Monday-Thursday; 4 days, 10 hours plus 1/2 hour unpaid lunch period each day.

B. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 5:30 p.m. Starting and quitting times shall occur at the employees' place of work as may be designated by the Contractor in accordance with area practice. The Contractor is not required to schedule a Day shift.

C. Second/Shift - The second shift (starting between 2 p.m. and 8 p.m.) shall consist of 8 hours work for an equal number of hours pay at the straight time rate plus 15% in lieu of overtime and exclusive of a 1/2 hour unpaid lunch period.

D. Scheduling - The Contractor, with the approval of the Owner or Owner's authorized Representative, shall have the option of scheduling either a five-day work week, or four-day work week, when mutually agreed upon, on a craft-by-craft basis. The Contractor, with the approval of the Owner/Owner's Representative, also has the option to set the workday hours consistent with Project requirements, the Project schedule, and minimization of interference with Owner's operations and traffic flow. When conditions beyond the control of the Contractor, as contemplated in and limited by the Owner's contract documents, occur, the Contractor may, with the approval of the Owner/Owner's Representative, and with mutual agreement of the Local Union on a craft-by-craft basis, which agreement shall not be unreasonably withheld, schedule Friday (where on Four Tens) or Saturday (where on Five Eights) during the calendar week in which a workday was lost, at straight time pay; provided the employees involved work a total of 40 hours or less during that work week, and also in accordance with each crafts' Exhibit "A".

E. Notice - Contractors shall provide not less than 5 days prior notice to the Local Union involved as to the work week and work hours schedules to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2. OVERTIME

Overtime pay for hours outside of the standard work week and work day, described in paragraph A above, shall be paid in accordance with the applicable Schedule A. There will be no restriction upon the Contractor's scheduling of overtime or the non-discriminatory designation of employees who shall be worked, except as noted in Article 5, Section 2. There shall be no pyramiding of overtime pay under any circumstances. The Contractor shall have the right to schedule work so as to minimize overtime.

SECTION 3. SHIFTS

A. Flexible Schedules - Scheduling of shift work shall remain flexible in order to meet Project schedules and existing Project conditions including the minimization of interference with traffic. It is not necessary to work a day shift in order to schedule a second shift. Shifts must be worked a minimum of five consecutive workdays, must have prior approval of the Owner and GC and must be scheduled with not less than five work days' notice to the Local Union.

B. Flexible Starting Times – Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of Paragraph A.

C. It is agreed that when project circumstances require a deviation from the above shifts, the involved unions, contractors and the General Contractor shall adjust the starting times of the above shifts or establish shifts which meet the project requirements. It is agreed that neither party will unreasonably withhold their agreement.

SECTION 4. HOLIDAYS

A. Schedule - There shall be 8 recognized holidays on the Project:

New Years Day	Labor Day
President's Day	Veterans Day
Memorial Day	Thanksgiving Day
Fourth of July	Christmas Day

* Presidential Election Day shall be observed as a holiday in a general election year. Work shall be scheduled on Columbus Day and Good Friday pursuant to the craft's Schedule A. The Friday after Thanksgiving shall be observed as a holiday for the Elevator Constructors only.

All said holidays shall be observed on the dates designated by New Jersey State Law. In the absence of such designations, they shall be observed on the calendar date except those holidays which occur on Sunday shall be observed on the following Monday. Holidays falling on Saturday are to be observed on the preceding Friday. No work shall be done on Labor Day except that of an emergency nature.

B. Payment - Regular holiday pay, if any, and/or premium pay for work performed on such a recognized holiday shall be in accordance with the applicable Schedule A.

C. Exclusivity - No holidays other than those listed in Section 4-A above shall be recognized nor observed.

SECTION 5. REPORTING PAY

A. Employees who report to the work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason, shall receive minimum reporting pay in accordance with the applicable Schedule A.

B. When an employee, who has completed their scheduled shift and left the Project site, is "called back" to perform special work of a casual, incidental or irregular nature, the employee shall receive pay for actual hours worked with a minimum guarantee, as may be required by the applicable Schedule A.

C. When an employee leaves the job or work location of their own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, they shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article or except where specifically provided in an applicable Schedule A, there shall be no premiums, bonuses, hazardous duty, high time or other special payments of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Agreement or except where specifically provided in an applicable Schedule A.

SECTION 6. PAYMENT OF WAGES

A. Payday - Payment shall be made by check, drawn on a New Jersey bank with branches located within commuting distance of the job site. Paychecks shall be issued by the Contractor at the job site by 10 a.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than 3 days wages shall

be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination-Employees who are laid-off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractors shall also provide the employee with a written statement setting forth the date of lay off or discharge.

SECTION 7. EMERGENCY WORK SUSPENSION

A Contractor or GC may, if considered necessary for the protection of life and /or safety of employees or others, suspend all or a portion of Project Work. In such instances, employees will be paid for actual time worked; provided, however, that when a Contractor request that employees remain at the job site available for work, employees will be paid for "stand-by" time at their hourly rate of pay.

SECTION 8. INJURY/DISABILITY

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than 8 hours wages for that day. Further, the employee shall be rehired at such time as able to return to duties provided there is still work available on the Project for which the employee is qualified and able to perform.

SECTION 9. TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 10. MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

SECTION 11. BREAK PERIODS

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's work location. Local area practice will prevail for coffee breaks that are not organized.

ARTICLE 13 - APPRENTICES

SECTION 1. RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A in a ratio not to exceed the ratio provided in the applicable Schedule A providing prevailing wage and fringe benefits as defined in N.J.S.A. 34:11-56.26(9) for the classification in Burlington County, New Jersey. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate collective bargaining agreement listed in Schedule A.

SECTION 2. DEPARTMENT OF LABOR

To assist the Contractors in attaining a maximum effort on this Project, the Unions agree to work in close cooperation with, and accept monitoring by, the New Jersey State and Federal Departments of Labor to ensure that minorities, women, or economically disadvantaged are afforded opportunities to participate in apprenticeship programs which result in the placement of apprentices on this Project. To further ensure that this Contractor effort is attained, up to 50% of the apprentices placed on this Project should be first year, minority, women or economically disadvantaged apprentices. The Local Unions will cooperate with Contractor request for minority, women or economically disadvantaged referrals to meet this Contractor effort.

SECTION 3. HELMETS TO HARDHATS

The Employers and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Employers and Unions agree to utilize the services of the Center for Military recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

The Unions and Employers agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on the Project and of apprenticeship and employment opportunities for the Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

ARTICLE 14 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1. SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA requirements and other requirements set forth in the contract documents are at all times maintained on the Project and the employees and Unions agree to cooperate fully with these efforts. Employees must perform their work at all times in a safe manner and protect themselves and the property of the Contractor and the Owner from injury or harm. Failure to do so will be grounds for discipline, including discharge.

SECTION 2. CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors and the GC for this Project. Such rules will be published and posted in conspicuous places throughout the Project.

SECTION 3. INSPECTIONS

The Contractors and GC retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - NO DISCRIMINATION

SECTION 1. COOPERATIVE EFFORTS

The Contractors and Unions agree that they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or age in any manner prohibited by law or regulation. It is recognized that special procedures maybe established by Contractors and Local Unions and the New Jersey State Department of Labor for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement will assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project.

SECTION 2. LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE 16 - GENERAL TERMS

SECTION 1. PROJECT RULES

The GC and the Contractors shall establish such reasonable Project rules as are appropriate for the good order of the Project, provided they do not violate the terms of this agreement. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

SECTION 2. TOOLS OF THE TRADES

The welding/cutting torch and chain fall, are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdiction.

SECTION 3. SUPERVISION

Employees shall work under the supervision of the craft foreperson or general foreperson.

SECTION 4. TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement and in Schedule A.

SECTION 5. FULL WORK DAY

Employees shall be at their staging area at the starting time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6. COOPERATION

The General Contractor and the Unions will cooperate in seeking any NJ State Department of Labor approvals that may be required for implementation of any terms of this Agreement.

ARTICLE 17 - SAVINGS AND SEPARABILITY

SECTION 1. THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of the Agreement shall remain in full force and effect. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties to this Agreement will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be let in the future.

SECTION 2. THE BID SPECIFICATIONS

In the event that the General Contractor's bid specifications, or other action, requiring that a successful bidder become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law such requirement shall be rendered, temporarily or permanently, null and void but the Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in constructions where the Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court action taken and the intent of the parties for contracts to be let in the future.

SECTION 3. NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the Owner, the Architect, the Construction Manager, the GC, or any Contractor, or any signatory Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4. NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

ARTICLE 18 - FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS

SECTION 1. CHANGES TO AREA CONTRACTS

A. Schedules A to this Agreement shall continue to full force and effect until the Contractor and/or Union parties to the Area Collective Bargaining Agreements which are the basis for Schedules A notify the General Contractor in writing of the mutually agreed upon changes in provisions of such agreements which are applicable to the Project, and their effective dates.

B. It is agreed that any provisions negotiated into Schedules A collective bargaining agreements will not apply to work on this Project if such provisions are less favorable to this Project than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provisions be recognized or applied on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Project Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedules "A" of provisions agreed upon in the renegotiations of Area Collective Bargaining Agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiations of Area Local Collective Bargaining Agreements nor shall there be any lock-out on the Project affecting a Local Union during the course of such renegotiations.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the _____ day of _____, _____.

Burlington County

**United Building Trades Council of
Southern New Jersey**

SCHEDULE A

A COPY OF EACH UNION'S CURRENT COLLECTIVE BARGAINING AGREEMENT IS INCLUDED AS PART OF SCHEDULE A BY REFERENCE, UPON EXECUTION BY THE SIGNATORY LOCAL.

PROJECT LABOR AGREEMENT

COVERING

**BURLINGTON COUNTY AGRICULTURAL CENTER 2026 IMPROVEMENTS
PROJECT**

CONTRACT NO. CPU-26-0051

IN BURLINGTON COUNTY, NEW JERSEY

LETTER OF ASSENT

Re: Project Labor Agreement
United Building Trades Council of Southern New Jersey and
the County of Burlington (the "Agreement")

The undersigned, as a General Contractor, Contractor(s) or Subcontractor(s) on a Contract which is part of large project construction for the above-referenced Project, for and in consideration of the award of a Contract to perform work on said Project, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

- (1) On behalf of itself and all its employees, accepts and agrees to be bound by the terms and conditions of the Project Labor Agreement, together with any and all amendments and supplements now existing or which are later made thereto, and understands that any act of non-compliance with all such terms and conditions will subject the non-complying Contractor or employee(s) to being prohibited from the Project Site until full compliance is obtained.
- (2) Certifies that it has no commitments or agreements that would preclude its full compliance with the terms and conditions of said Projects Labor Agreement.
- (3) Agrees to secure from any Contractor(s) (as defined in said Project Labor Agreement) which is or becomes a Subcontractor(s) (of any tier), a duly executed Letter of Assent in form identical to this document prior to commencement of any work.

Company Name

By: _____

Contract Number CPU-26-0051

Title: _____

General Contractor _____

Date: _____

cc: (Unions employed by Contractor)

SECTION 00590
SECURITY FORMS AND BACKGROUND CHECK PROCEDURE

This project will be conducted in a County facility and background checks for all employees working on site may be required.

If required or deemed to be in the County's best interest to do so, the County reserves the right to require background checks on any personnel of the Contractor who shall perform work on County owned or leased property.

The Background check process shall be as follows:

The employee shall fill out the attached IdentoGO form and make an appointment with the vendor for a universal fingerprint history check. The history check will be mailed to the employees home address. Upon receiving the history check performed by IdentoGO, the employee shall then fill out the Burlington County Background Check Form and submit a signed copy along with the background check provided by IdentoGO to the County Project Manager.

The County Project Manager shall then transfer the forms to the Sheriff's Department for review.

Upon receipt of the forms, the Sheriff's Department will review the information provided and determination if the employee is eligible to work on this project. The decision rendered by the Sheriffs Department is final, no exceptions will be made.

TWIC cards are not an acceptable form of Identification and a new check must be provided every 12 months.

Both Forms are Included herein for your use and distribution to employees.

The IdentoGO background check shall be provided to the County at no additional cost.

New _____
Renewal _____

BURLINGTON COUNTY
SECURITY CLEARANCE REQUEST FOR
BURLINGTON COUNTY COURTS COMPLEX

OTC _____
SUB _____
FPT: Y/N

NAME: Last		First	Middle
ADDRESS:		CITY	STATE ZIP CODE
DATE OF BIRTH	SOCIAL SECURITY #	All applicable telephone numbers	
VEHICLE MAKE/MODEL	VEHICLE TAG # AND STATE	DRIVERS LICENSE # & STATE	

Please **print** all information **legibly**. **Any unreadable information will delay security background check and/or possible employment.** IF YOU HAVE A DRIVER'S LICENSE, YOU **MUST** LIST IT IN THE APPROPRIATE BOX. IF YOU DO **NOT** HAVE A DRIVER'S LICENSE, LIST "**NONE**" IN THE BOX. **THIS INCLUDES AN I.D. ONLY.**

ANY INCOMPLETE FORMS WILL NOT BE ACCEPTED.

1. Have you **ever** been arrested? ☐ Yes ☐ No (List all arrests)

Date: _____	Location: _____	Reason: _____
Date: _____	Location: _____	Reason: _____
Date: _____	Location: _____	Reason: _____

2. Have you ever been convicted of a crime? ☐ Yes ☐ No

Date: _____	Location: _____	Reason: _____
Date: _____	Location: _____	Reason: _____

3. List ANY and ALL names you have used in the past; to include maiden, married, nicknames, AKA's, etc. _____

****FAILURE TO LIST ANY ARREST AND/OR CONVICTION WILL AUTOMATICALLY RESULT IN A FAILED BACKGROUND CHECK AND APPLICANT WILL NOT BE APPROVED FOR EMPLOYMENT.****

PRESENT EMPLOYER: _____

I hereby state and affirm that all the information listed above is true and accurate, and I give the Burlington County Sheriff's Department my permission to conduct a background security check.

Signature

Date

(1) Originating Agency Number (ORI #) NJPRR0000		(2) Category PRX		(3) Statute Number 13:59-1	
(4) Reason for Fingerprinting PERSONAL RECORD REQUEST				(5) Document Type S1	(6) Payment Information \$40.70
(7) Contributor's Case # (Unique Identifier) PRR				(8) Miscellaneous	
(9) First Name		(10) MI		(11) Last Name	
(12) Daytime Phone Number () -		(13) Social Security Number (Optional)		(14) Date of Birth	(15) Height
(16) Weight		(17) Maiden or Alias Last Name		(18) Place of Birth (US State if US Citizen; Country for all others)	
(19) Country of Citizenship		(20) Home Address			
Address		City		State Zip	
(21) Gender (Select one) [] Female [] Male [] Both		(22) Hair Color		(23) Eye Color	
(24) Race (Select One) [A] Asian/ Pacific Islander (includes Asian Indian) [B] Black [I] American Indian / Alaska Native [W] White (Includes Hispanic/ Spanish Origin) [U] Unknown					
(25) Occupation / Position (with respect to Requirement)		(26) Employer / Organization Name (with respect to Requirement)			
Employer Address		City State Zip			

Identification Requirement - Acceptable Identification must be presented at the time of printing. Identification presented MUST be one (1) document that is current (not expired). A combination of documents will not be accepted. The single document must include the following criteria: Photo, Name, Address (home/employer), Date of Birth. Acceptable ID must be issued by a Federal, State, County or Municipal entity for identification purposes. Examples of acceptable ID are: 1) Valid U.S. State Photo Driver's License/ Non Driver's License, 2) U.S. Passport, 3) USCIS Permanent Resident ID Card (issued after 5/10/2010), and 4) USCIS Employment Authorization Card (issued after 10/31/2010).

Please READ This Form Carefully:

Follow all of the instructions provided by your agency/employer to complete the fingerprint process. You must have this form (Blocks 1 through 26) completed prior to scheduling your fingerprint appointment via the website or call center. **PLEASE PRINT LEGIBLY.** It is **required** that you **present** this completed Universal Fingerprint Form, IDG_NJAPP_020115_V2, at your scheduled appointment.

Appointment Scheduling:

Scheduling is available anytime at www.bioapplicant.com/nj. Appointments may also be scheduled through our Call Center. English and Spanish speaking agents are available at **1-877-503-5981**, Monday through Friday, 8:00AM to 5:00PM EST and Saturday, 8:00AM to 12 Noon EST.

Payment:

When an applicant is responsible for payment, payment is required at the time of scheduling. The following forms of payment are accepted: Visa, MasterCard, prepaid debit cards, or electronic debit (ACH) from a checking account. Accounts will be debited immediately.

Cancel/ Reschedule:

Appointments may be canceled or rescheduled via the website or the call center before the deadline of 5PM EST the business day prior to the scheduled appointment (Saturday Noon for Monday appointments). An appointment fee of \$10.00 plus tax (\$10.70) will be incurred by applicants who do not cancel/reschedule their appointment prior to the deadline. MorphoTrust will refund the remainder of the fee paid (state/federal search fees) to the original payment method.

Unable to be Fingerprinted:

An applicant is considered "Unable to be Fingerprinted" for any of the following reasons: Failure to appear for scheduled appointment, inability to present proper identification, inability to present this completed Universal Fingerprint Form IDG_NJAPP_020115_V2, or the information on this form does not exactly match the information provided during the scheduling process. Applicants unable to be fingerprinted will incur a \$10.00 plus tax (\$10.70) appointment fee. MorphoTrust will refund the remainder of the fee paid (state/federal search fees) to the original payment method.

PCN and Receipts:

Upon the completion of fingerprinting you will be assigned a PCN number. The PCN will be recorded on this form and on your receipt. MorphoTrust will not provide duplicate receipts, PCN Numbers or any appointment/printing information after the time of printing.

Applicant ID Number:	Payment Authorization:	PCN:
Scheduled Day & Date:	Scheduled Time:	Scheduled Site:
Agency Information:		

You **MUST** retain a copy of this form and the receipt of printing for your personal records.

APPLICANTS MUST NOT ALTER, SHARE, OR REUSE THIS FORM

SECTION 00600
NON-DEBARMENT CERTIFICATION

Bidders shall be required to complete the Non-Debarment Certification located under the Attributes tab within the solicitation at <https://burlcobids.ionwave.net>.

***** END OF SECTION 00600 NON-DEBARMENT CERTIFICATION*****

SECTION 00700
ANTI-DISCRIMINATION AGREEMENT

The Anti-Discrimination Agreement shall be submitted electronically under the Attributes tab at
<https://burlcobids.ionwave.net>

***** END OF SECTION 00700 ANTI-DISCRIMINATION AGREEMENT*****

The following terms and conditions shall be added to the General Conditions. If any of the terms and conditions below conflict with those contained within the General Conditions, the more stringent and favorable to the Owner shall apply and presumed bid by the Contractor, unless otherwise determined by the Owner.

HOLD HARMLESS/INDEMNIFICATION

The Bidder agrees that upon execution of the CONTRACT for the services and/or goods outlined in these specifications the Bidder shall defend, indemnify and hold harmless **Burlington County** and its agents, officers and employees from and against all claims, demands, actions, lawsuits, damages, judgments or liabilities (including attorney fees and costs of legal and administrative proceedings) including, but not limited to property damage or loss and/or personal injury including loss of life of any person, agency, corporation or governmental entity arising out of the purchase, installation and/or services related to **Burlington County Agricultural Center-2026 Improvements** to be provided by the Bidder to **Burlington County** resulting from any act or omission by the Bidder, its officers, employees, agents, servants or subcontractors in the performance of any responsibility or service relating to the Contract. The BIDDER further agrees that this indemnification by the BIDDER shall continue after completion of the CONTRACT for all claims, demands, suits, actions, recoveries, judgments, costs and expenses including attorney's fees resulting from acts or omissions the BIDDER, its officers, employees, agents, servants or subcontractors which occur prior to the completion of the CONTRACT. Notwithstanding any other provision of this paragraph, the Bidder is not responsible for indemnification of **Burlington County**, its agents, officers, employees from claims, actions, lawsuits, damages, judgments, or liabilities arising out of the negligence or deliberate or willful actions on the part of **Burlington County** agents, officers and employees.

Burlington County shall not be responsible for representing or defending the Bidder, its officers, employees, agents, servants or subcontractors who may be named as defendants in any lawsuit, or in connection with any civil claim including, but not limited to tort, contractual or civil rights claims.

DISCREPANCIES, ERRORS AND OMISSIONS

The Contract Documents are intended to be mutually explanatory of each other, but should any discrepancy appear or any contradiction arise or be detected by the Contractor as to anything contained therein, the Contractor shall promptly call the same to the attention of the Engineer and the Contractor shall be deemed to have bid the Contract predicated on the more expensive way of performing such work and the interpretation and decision of the Engineer shall be binding on the Contractor. The Contractor shall be held responsible for all corrective measures and associated costs for failure to notify the Engineer of such discrepancy or contradiction.

Any correction of errors or omissions in the Contract Documents may be made by the Engineer when such correction is necessary for the proper fulfillment of the Contract as construed by them. Except as otherwise provided in this Supplementary General Condition, where said correction of errors or omissions materially adds to the cost of or time required for the work to be done by the Contractor, compensation for said additional work and/or an extension of time

may be granted under the terms of the General Conditions.

If any item of work is required by the Drawings but is omitted in the Specifications, such item shall be required. If any item of work is required by the Specification but omitted in the Drawings, such item shall be required. If any item of work is omitted in both the Drawings and Specifications, whether intentionally or otherwise, when the same is usually and customarily required to complete fully the work specified herein, such item shall be required. None of the foregoing shall entitle the Contractor to extra compensation or an extension of time, but the said items of work shall be provided as if called for by all of the Contract Documents.

END SECTION 000800

BASIS OF PAYMENT- ELECTRICAL WORK

1. SITE LIGHTING

- A. Quantity: The quantity for which payment will be made will be a lump sum covering all of the work as shown on the plans and specifications or as directed by the Architect. Total quantity of SITE LIGHTING is one (1).
- B. Payment: Payment will be made for the quantity as above determined, at the lump sum price bid in the proposal for the item SITE LIGHTING, which shall include the cost of materials, labor, and equipment associated with trench excavation, wiring, backfilling with sand and warning tape, topsoiling, seeding, installation of controls, light poles, light fixtures, exterior building mounted lighting, necessary utility connections, and all else necessary therefore and incidental thereto.

2. ELECTRICAL SERVICE TO RESTROOM BUILDING

- A. Quantity: The quantity for which payment will be made will be a lump sum covering all of the work as shown on the plans and specifications or as directed by the Architect.
- C. Payment: Payment will be made for the quantity as above determined, at the lump sum price bid in the proposal for the item, which shall include the cost of materials, labor, and equipment associated with trench excavation, wiring, backfilling with sand and warning tape, trench restoration necessary to make connection between ground mounted transformer and the restroom building, and all else necessary therefore and incidental thereto. Electrical service from the utility provider to the transformer will be provided by others. The General Contractor shall coordinate with work by others as necessary to complete the work.

BASIS OF PAYMENT- SITE STRUCTURES

1. RESTROOM BUILDING

- A. Quantity: The quantity for which payment will be made will be a lump sum covering all of the work as shown on the plans and specifications or as directed by the Architect.
- B. Payment: Payment will be made for the quantity as above determined, at the lump sum price bid in the proposal for the item RESTROOM BUILDING, which shall include the cost of materials, labor, and equipment associated with excavation, foundations, concrete slab, masonry, wood framing, sheathing, plumbing, electrical, mechanical, siding, roofing, soffits, doors, windows, hardware, flashing, trim, fixtures, finishes, painting, necessary connections, and all else necessary therefore and incidental thereto.

SECTION 013599 – TRAFFIC CONTROL & TRAFFIC SIGNS

PART I – GENERAL

1.01 SCOPE OF WORK

- A. The contractor shall supply a Traffic Control Plan and method in an acceptable form for safe and convenient passage for vehicular, pedestrian and construction traffic associated with existing park walkways, parking areas, interior driveways, and adjacent roadways when necessary.
- B. The contractor shall provide a traffic control plan approved by authorities having jurisdiction.
- C. The contractor shall supply all labor, tools, equipment, materials and services necessary to comply with said 'Traffic Control Plan', the NJDOT approved traffic control plan and with the drawings for Permanent Signage.

1.02 RELATED SECTIONS

- 1. Section 311001 - Site Clearing
- 2. Section 310001 - Earthwork
- 3. Section 313001 - Soil Erosion and Sediment Control
- 4. Section 321201 – Bituminous Asphalt Paving
- 5. Section 321601 – Site Concrete

1.03 REGULATIONS AND SUBMITTALS

- A. All work to conform to NJDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 159 Traffic Control (NJDOT).
- B. When required, submit Traffic Control Plan and approvals from the governing authorities. The authorities to include, at a minimum, the Moorestown Township Police Department and Burlington County.
- C. Provisions for Emergency Traffic shall be maintained at all times during construction for both the County Road, State Highway and on-site access.

1.04 QUALITY ASSURANCE

- A. Prior to the start of construction, the contractor shall assign a supervisory level employee the duties of a Traffic Control Coordinator in accordance with NJDOT Section 159.03.01. The Moorestown Township Police Department and the Landscape Architect shall be notified of this person's name and method of contact.
- B. Traffic Directors shall be a trained flagger and shall follow the procedures set forth in the Manual on Uniform Traffic Control Devices (MUTCD), Part VI, Section 6E.01 thru 6E.05, and NJDOT Section 159.03.08, Traffic Directors. Where local ordinances require, Traffic Directors shall be uniformed police officers. Contractor to verify local regulations.

PART 2 – PRODUCTS

2.01 CONSTRUCTION SIGNAGE

- A. Construction Signage shall include, but is not limited to the following; Advanced Warning Signs, Work Zone Signs, Channelization Signs and Detour Signs. All proposed signage shall be reflective and in accordance with the MUTCD Chapter 6F and NJDOT Section 159.03.02.

2.02 CONSTRUCTION BARRIERS

- A. All proposed barriers shall include, but are not limited to, cones, drums and/or barricades. All are to be in accordance with the MUTCD Chapter 6F and NJDOT Section 159.03.02.

PART 3 - EXECUTION

3.01 PROCEDURES

- A. Prior to construction, the contractor is to provide the owner, approving agency(ies), and all affected parties with a Traffic Control Staging Plan and Construction Schedule, which may or may not affect the traffic patterns along the, existing park trails, County Road and the State Highway, but at a minimum, shall describe the activities and barriers required for work within the County Right of Way.
- B. Prior to construction, install all advanced warning signs of construction entrance and activities.
- C. Maintain through traffic at all times.
- D. Temporary Traffic Control Devices do not need to be new, however, all devices must be in good condition and conform to the MUTCD.
- E. Prior to any work within the County or State Right of Ways or existing park trails, erect all warning signs, barricades, and manpower required to restrict traffic, divert traffic and create a safe working area for construction activities.
- F. Reduction of the number of lanes available for through traffic or construction of pavement widening will not be permitted until after 9 am in the morning and shall be removed prior to 4 pm in the afternoon.
- G. Work which may interfere with traffic or restrict the travel way shall not be performed on Saturdays, Sundays or Legal Holidays unless otherwise directed by the approving authorities.
- H. Subsequent to all work completed in the County and State Right of Ways, internal driveways, parking areas, existing park walkways, the contractor is responsible for the removal of all barriers and signage.
- I. Install permanent signage subsequent to the completion of all site paving and pavement markings and in the locations as specified on the drawings.

PART 4 - PAYMENT

4.01 Temporary Traffic Control Services and Devices

- A. Quantity: The quantity for which payment will be made will be based upon a lump sum covering all traffic control measures, manpower and equipment described above or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment for temporary traffic control services and devices shall be included in the price quoted in the Proposal for the Item Temporary Traffic Control Services and Devices, which price shall include the cost of furnishing, assembling and installing the signage where necessary to safely maintain safe pedestrian and vehicular access, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 013599 TRAFFIC CONTROL & TRAFFIC SIGNS

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Concealed surface form-facing material.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork:** Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 RELATED MATERIALS

- A. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301 (ACI 301M).
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
- D. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
- E. 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.
 - 1. Provide and secure units to support screed strips.
 - 2. Use strike-off templates or compacting-type screeds.
- G. At construction joints, overlap forms onto previously placed concrete not less than 12 inches (305 mm).
- H. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars:** ASTM A615/A615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded-Wire Reinforcement:** ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports:** Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
- B. Steel Tie Wire:** ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 1. Do not cut or puncture vapor retarder.
 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
 2. Stagger splices in accordance with ACI 318 (ACI 318M).
- G. Install welded-wire reinforcement in longest practicable lengths.
 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

- A. 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.
 2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117 (ACI 117M).

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Vapor retarders.
5. Curing materials.
6. Accessories.
7. Repair materials.
8. Concrete mixture materials.
9. Concrete mixture class types.
10. Concrete mixing.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product data.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Slump or slump flow limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Intended placement method.
10. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Cementitious Materials:

- 1. Portland Cement: ASTM C150/C150M, Type I.

- B. Normal-Weight Aggregates:

- 1. Coarse Aggregate: ASTM C33/C33M, Class 1S.
 - 2. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
 - 3. Fine Aggregate: ASTM C33/C33M.
 - 4. Alkali-Silica Reaction: Comply with one of the following for each aggregate used:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567. Do not use this option with fly ash with an alkali content greater than 4.0 percent. Submit supporting data for each aggregate showing expansion in excess of 0.10 percent when tested in accordance with ASTM C1260.
 - c. Alkali Content in Concrete: Not to exceed 4 lb./cu. yd. (2.37 kg/cu. m) for aggregate with expansion greater than or equal to 0.04 percent and less than 0.12 percent or 3 lb./cu. yd. (1.78 kg/cu. m) for aggregate with expansion greater than or equal to 0.12 percent and less than 0.24 percent. Test aggregate reactivity in accordance with ASTM C1293. Calculate alkali content of concrete in accordance with ACI 301 (ACI 301M). Do not use this option with natural pozzolan or fly ash that has a calcium oxide content greater than 18 percent or an alkali content greater than 4.0 percent; or for an aggregate with expansion at one year greater than or equal to 0.24 percent when tested in accordance with ASTM C1293.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.

2.4 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- C. Curing Paper: 8 ft. (2438 mm) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- D. Water: Potable water that does not cause staining of the surface.

2.6 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.

2.8 CONCRETE MIXTURE MATERIALS

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 1. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 2. Use permeability-reducing admixture in concrete mixtures where indicated.

2.9 CONCRETE MIXTURE CLASS TYPES

- A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.
 1. Exposure Class: ACI 318 (ACI 318M) Class F0, Class S1, Class W0, Class C1.
 2. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 3. Maximum w/cm Ratio: 0.50.
 4. Slump Limit: 5 inches (125 mm), plus or minus 1-1/2 inches (40 mm) for concrete.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cementitious materials.
- B. Class C: Normal-weight concrete used for interior slabs-on-ground.
 1. Exposure Class: ACI 318 (ACI 318M) Class F0, Class S0, Class W0, Class C0.
 2. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 3. Maximum w/cm Ratio : 0.50.
 4. Slump Limit: 5 inches (125 mm), plus or minus 1.5 inches (40 mm) for concrete.
 5. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 TOLERANCES

- A. Comply with ACI 117 (ACI 117M).

3.3 INSTALLATION OF VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

3.4 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
- 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.

3.5 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.6 APPLICATION OF FINISHING FLOORS AND SLABS

A. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

B. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to 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.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155 (ASTM E1155M), for a randomly trafficked floor surface:

a. Slabs on Ground:

- 1) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.7 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1 inch (25 mm).
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 (ACI 117M), Class D.
 - e. Apply to concrete surfaces for metal lap pan deck formed surfaces and those surfaces that are buried or covered with subsequent installed surfaces.
2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/4 inch (6 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 (ACI 117M), Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches (100 mm) high unless otherwise indicated on Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

3.9 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305R, before and during finishing operations.

B. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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 (300 mm), and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.

3.10 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

3.11 INSTALLATION OF CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch (0.25 mm) spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, 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 (13 mm) in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch (19 mm).
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. 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 matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and match surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.
- D. Repairing Unformed Surfaces:
 - 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
 - 3. After concrete has cured at least 14 days, correct high areas by grinding.
 - 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
 - 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

- a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
 - 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 7. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
 - 8. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. 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.
- 3.12 PROTECTION
- A. Protect concrete surfaces.
 - B. Protect from petroleum stains.
 - C. Prohibit placement of steel items on concrete surfaces.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s):** Concrete masonry unit(s).
- B. Reinforced Masonry:** Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Shop Drawings:** For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates:** For each type and size of product. For masonry units, include data on material properties and/or material test reports substantiating compliance with requirements.
- B. Mix Designs:** For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

- A. 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. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, 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.

2.2 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.
- B. Insulated CMUs: Provide specially shaped, molded-polystyrene insulation units complying with ASTM C578, Type I, designed for installing in cores of masonry units for all units.
- C. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 - 2. Density Classification: Normal weight.

2.3 CONCRETE LINTELS

- A. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, 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.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

- D. Aggregate for Mortar: ASTM C144.
 - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
- E. Aggregate for Grout: ASTM C404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- G. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, 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 (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 5. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.
 - 6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.

2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Flexible Flashing: Use the following unless otherwise indicated:
1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 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/D226M, Type I (No. 15 asphalt felt).

2.9 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. Use portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended 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 C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type N.

3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. 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 (12 mm) 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 (6 mm in 3 m), or 1/2-inch (12-mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. 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 (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 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: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in grouted masonry, including starting course on footings.
 3. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs 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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) 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.

3.7 FLASHING

- A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall 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, or tape as recommended by flashing manufacturer.
 - 2. At lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 - 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

3.8 REINFORCED UNIT MASONRY

- A. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- B. 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 12.67 ft. (3.86 m).

3.9 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.10 MASONRY WASTE DISPOSAL

- A. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Wood furring and grounds.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. 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 ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.

2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.
 3. Timber. No limit.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Framing Other Than Non-Load-Bearing Partitions by Grade: Construction or No. 2 grade.
1. Application: Framing other than interior partitions.
 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Douglas fir-larch; WCLIB or WWPA.
 - c. Southern pine or mixed southern pine; SPIB.
 - d. Spruce-pine-fir; NLGA.
 - e. Douglas fir-south; WWPA.
 - f. Hem-fir; WCLIB or WWPA.

- g. Douglas fir-larch (north); NLGA.
- h. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.

- B. Framing Other Than Non-Load-Bearing Partitions by Performance: Any species and grade with a modulus of elasticity of at least 1,100,000 psi (7590 MPa) and an extreme fiber stress in bending of at least 700 psi (4.83 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.

- 1. Application: Framing other than interior partitions.

2.4 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

- 1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20.0 MPa) for 12-inch nominal- (286-mm actual-) depth members.
 - 2. Modulus of Elasticity, Edgewise: 1,800,000 psi (12 400 MPa).

2.5 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

- 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
 - 4. Grounds.

- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:

- 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Eastern softwoods; No. 2 Common grade; NeLMA.
 - 3. Northern species; No. 2 Common grade; NLGA.
 - 4. Western woods; Construction or No. 2 Common grade; WCLIB or WWP.

2.6 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

- 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

2.7 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets:
 - 1. Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.

- F. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated.

2.2 WALL SHEATHING

- A. Plywood Sheathing, Walls: DOC PS 1, Exposure 1, Structural I sheathing.

2.3 ROOF SHEATHING

- A. Plywood Sheathing, Roofs: DOC PS 1, Exposure 1, Structural I sheathing.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior wood and cellular PVC trim.

1.2 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece.

2.2 EXTERIOR TRIM

- A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AZEK Building Products, Inc.
 - b. CertainTeed Corporation.
 - c. Royal Mouldings Limited.
 - 2. Density: Not less than 31 lb/cu. ft. (500 kg/cu. m).

3. Heat Deflection Temperature: Not less than 130 deg F (54 deg C), according to ASTM D 648.
4. Water Absorption: Not more than 1 percent, according to ASTM D 570.
5. Flame-Spread Index: 75 or less, according to ASTM E 84.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 1. For applications not otherwise indicated, provide stainless steel fasteners.
- B. Sealants: Latex, complying with ASTM C834 and applicable requirements in Section 079200 "Joint Sealants," and recommended by sealant and substrate manufacturers for intended application.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.
 1. Cut to required lengths and prime ends.
 2. Comply with requirements in Section 099113 "Exterior Painting."

3.2 INSTALLATION, GENERAL

- A. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
 1. Use concealed shims where necessary for alignment.
 2. Scribe and cut exterior finish carpentry to fit adjoining work.
 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
 5. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.3 INSTALLATION OF STANDING AND RUNNING TRIM

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
 1. Use scarf joints for end-to-end joints.
 2. Stagger end joints in adjacent and related members.

- B. Fit exterior joints to exclude water.
 - 1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.
 - 2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- C. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

END OF SECTION 062013

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Spray-applied cellulosic insulation.

1.2 ACTION SUBMITTALS

A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics:** Maximum flame-spread and smoke-developed indexes less than Class C, 200 and 450 when tested in accordance with ASTM E84.
- B. Labeling:** Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
- C. Thermal-Resistance Value (R-Value):** R-value as indicated below in accordance with ASTM C518.
1. R-Value at Attic: R-38.0.
 2. R-Value Below Slab: R-11.0.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION (XPS)

- A. Extruded Polystyrene Board Insulation, Type IV:** ASTM C578, Type IV, 25 psi (173 kPa) minimum compressive strength; unfaced.

2.3 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Kraft Faced:** ASTM C665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Miscellaneous Application Accessories:

1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
2. Crack Sealer: Closed-cell insulating foam in aerosol dispenser recommended in writing by insulation manufacturer for filling gaps in board insulation.
3. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in accordance with manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units in accordance with manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members in accordance with the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For wood-framed construction, install blankets in accordance with ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.
- C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation in accordance with manufacturer's written instructions.
 1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
 2. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

- A. Polyethylene Vapor Retarders:** ASTM D4397, 10-mil- (0.25-mm-) thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

PART 3 - EXECUTION

3.1 INSTALLATION OF VAPOR RETARDERS IN CRAWL SPACES

- A. Install vapor retarders over prepared grade. Lap joints a minimum of 12 inches (305 mm) and seal with manufacturer's recommended tape. Install second layer over pathways to equipment.**
- B. Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.**

END OF SECTION 072600

SECTION 072715 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Self-adhering, vapor-permeable, nonbituminous sheet air barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance:** Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage:** Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested in accordance with ASTM E2357.

2.2 NONBITUMINOUS SHEET AIR BARRIER

- A. Vapor-Permeable Nonbituminous Sheet:** Minimum 20-mil- (0.5-mm-) thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.
1. Henry, a Carlisle Company; Blueskin VP160
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.

- b. Puncture Resistance: Minimum 40 lbf (180 N); ASTM E154/E154M.
- c. Vapor Permeance: Minimum 15 perms (860 ng/Pa x s x sq. m); ASTM E96/E96M, Desiccant Method, Procedure A.
- d. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested in accordance with ASTM D4541 as modified by ABAA.
- e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- f. UV Resistance: Can be exposed to sunlight for 150 days in accordance with manufacturer's written instructions.

2.3 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- C. Bridge expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

3.2 INSTALLATION

- A. Install materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

- C. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
 - 1. Apply sheets in a shingled manner to shed water.
 - 2. Roll sheets firmly to enhance adhesion to substrate.
- D. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
- F. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.3 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.

END OF SECTION 072715

SECTION 074113.13 - FORMED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Corrugated-profile, exposed-fastener metal roof panels.
2. Underlayment.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For formed metal roof panels. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples: Actual sample of finished products for each type of exposed finish for metal panels, clips, fasteners, closures, and other metal panel accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For formed metal roof panels, for tests performed by a qualified testing agency.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 1. Wind Loads: Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
 2. Other Design Loads: 25 lbf/sq. ft. (1197 Pa).
 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 1. Uplift Rating: UL 90.
- F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 1. Fire/Windstorm Classification: Class 1A-90.
 2. Hail Resistance: MH.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations 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.

2.2 EXPOSED-FASTENER METAL ROOF PANELS, GENERAL

- A. Provide factory-formed metal roof panels designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners. Include accessories required for weathertight installation.

2.3 CORRUGATED-PROFILE, EXPOSED-FASTENER METAL ROOF PANELS

- A. Tapered-Rib-Profile, Exposed-Fastener Metal Roof Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide McElroy Metal, Inc; Multi-Rib or a comparable product by one of the following:
 - a. AEP Span; A BlueScope Steel Company.
 - b. Architectural Metal Systems.
 - c. Berridge Manufacturing Company.
 - d. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 - e. CENTRIA Architectural Systems.
 - f. Fabral.
 - g. Flexospan Steel Buildings, Inc.
 - h. MBCI; a division of NCI Group, Inc.
 - i. Metal Sales Manufacturing Corporation.
 - j. Petersen Aluminum Corporation.
- 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
- 3. Major-Rib Spacing: 12 inches (305 mm) o.c.
- 4. Panel Coverage: 36 inches (914 mm).
- 5. Panel Height: 1.25 inches (32 mm).

- B. Panels: Formed with alternating trapezoidal ribs.

- 1. Structural Support: Over solid deck.
- 2. Fasteners: Manufacturer's standard screw fasteners.

2.4 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, specifically designed to withstand high

metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 220 deg F (111 deg C); ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970/D1970M.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn.
 - c. Henry Company.

- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.5 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system, including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- D. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.6 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with manufacturer's recommendations.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 same piece are unacceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel and Aluminum Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 INSTALLATION OF METAL ROOF PANELS

- A. Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that are concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel Work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to exterior; use galvanized-steel fasteners for surfaces exposed to interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Exposed-Fastener, Metal Roof Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
 6. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal panel system, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended in writing by metal panel manufacturer.
- F. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
 1. Install exposed flashing and trim that are without buckling and tool marks, and that are true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 ft. (3 m), with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked

flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

- G. Pipe and Conduit Penetrations: Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.13

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiber-cement siding and soffit.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - 1. Hardie Panel, Select Cedarmill, Vertical Siding by James Hardie Building Products, Inc.
- B. Labeling: Provide fiber-cement siding that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch (8 mm).

- D. Vertical Pattern: 48-inch- (1200-mm-) wide sheets with wood-grain texture and battens 12 inches (300 mm) o.c.
- E. Panel Texture: 48-inch- (1200-mm-) wide sheets with wood-grain texture.
- F. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame-spread index of 25 or less when tested in accordance with ASTM E84.
 - 1. Hardie Panel, Vented Cedarmill, Soffit by James Hardie Building Products, Inc.
- B. Nominal Thickness: Not less than 5/16 inch (8 mm).
- C. Pattern: 16-inch- (400-mm-) wide sheets with wood-grain texture.
- D. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
- B. Flashing: Provide stainless steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at door heads and where indicated.
- C. Fasteners:
 - 1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
 - 2. For fastening fiber cement, use stainless steel fasteners.
- D. Insect Screening for Soffit Vents: PVC-coated, glass-fiber fabric, 18-by-14 or 18-by-16 (1.4-by-1.8- or 1.4-by-1.6-mm) mesh.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Install fasteners no more than 24 inches (600 mm) o.c.

- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:

1. Roof-edge drainage systems.
2. Underlayment.

1.2 ACTION SUBMITTALS

- A. Product data.

- B. Shop Drawings: For roof specialties.

1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre manufactured- and field-assembled installation.
2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

- C. Samples: For each type of roof specialty indicated with factory-applied color finishes.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 074113.16 "Standing-Seam Metal Roof Panels."

- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
- 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

- A. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 - 1. Aluminum Sheet: 0.040 inch (1.02 mm) thick.
 - 2. Gutter Profile: Style K according to SMACNA's "Architectural Sheet Metal Manual."
 - 3. Gutter Supports: Gutter brackets with finish matching the gutters.
 - 4. Gutter Accessories: Flat ends for half-round gutter.
- B. Downspouts: Plain round complete with smooth-curve elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Extruded Aluminum: 0.125 inch (3.19 mm) thick with union sleeves and pre-fabricated elbows as required. Provide style 2 brackets. Basis-of-Design Product: Subject to compliance with requirements, provide DS-EX Designer Series Downspout Extruded Round, 3-inch diameter, by SAF Perimeter Systems; or comparable product.
- C. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.3 SHEET METAL MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
 - 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.4 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum 30 mils (0.76 mm) thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970/D1970M.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (minus 29 deg C) or lower; ASTM D1970/D1970M.
- B. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kb/sq. m) minimum.

2.5 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet Underlayment:
 - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
 - 2. Prime substrate if recommended by underlayment manufacturer.
 - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
 - 5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
 - 6. Roll laps and edges with roller.
 - 7. Cover underlayment within 14 days.
- B. Slip Sheet: Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
 - 1. Install in shingle fashion to shed water.
 - 2. Lapp joints not less than 4 inches (100 mm).

3.2 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.

3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 4. Torch cutting of roof specialties is not permitted.
 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.
1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 ft. (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.3 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

- A. Install components to produce a complete roof-edge drainage system in accordance with manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches (762 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
1. Install gutter with expansion joints at locations indicated. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.
1. Connect downspouts to underground drainage system indicated.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- B. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 077100

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pad-type, flat-mounted metal snow guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Samples:

1. Pad-Type Snow Guards: Full-size unit with installation hardware.

- a. For units with factory-applied finishes, submit manufacturer's standard color selections.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 PAD-TYPE SNOW GUARDS

A. Pad-Type, Flat-Mounted Metal Snow Guards:

1. Snow Defender 4500 by Best Buy Metals.
2. Material:

- a. ASTM A240/A240M, Type 304 stainless steel sheet, not less than 0.0156 inch (0.396 mm) thick.

- 1) Finish: High-performance organic two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
 - a) Color: As selected by Architect from manufacturer's full range.
3. Attachment: Manufacturer's tested system, capable of resisting design loads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
 1. Space rows as indicated on Drawings.
- B. Attachment for Exposed Fastened Metal Roofing:
 1. Do not use fasteners that will void metal roofing finish warranty.
 2. Pad-Type, Flat-Mounted Snow Guards:
 - a. Mechanically fasten to metal roofing, using fasteners identical to those used to secure metal roofing to substrate.

END OF SECTION 077253

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Mildew-resistant joint sealants.
 - 4. Latex joint sealants.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Samples: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-sealant schedule.

1.3 CLOSEOUT SUBMITTALS

- A. Warranty Documentation:
 - 1. Manufacturers' special warranties.
 - 2. Installer's special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, 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 joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation; Joint Sealants.
 - f. Tremco Incorporated.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation; Construction Systems.

- b. Bostik, Inc.
 - c. Pecora Corporation.
 - d. Schnee-Morehead, Inc., an ITW company.
 - e. Sika Corporation; Joint Sealants.
 - f. Tremco Incorporated.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Pecora Corporation.
 - c. Schnee-Morehead, Inc., an ITW company.
- C. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. LymTal International Inc.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. BASF Corporation; Construction Systems.
- b. Bostik, Inc.
- c. Pecora Corporation.
- d. Schnee-Morehead, Inc., an ITW company.
- e. Sika Corporation; Joint Sealants.
- f. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.7 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, 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. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.

- c. Unglazed surfaces of ceramic tile.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply 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 or primer 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 OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants 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.
- D. 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.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs 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 profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- F. 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.
- G. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Joints in stone paving units.
 - c. Joints between different materials listed above.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, M, P, 50, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of unit masonry walls.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior standard steel doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Subject to compliance with requirements, provide Ceco Door, an Assa Abloy Company, HD2-Panel, embossed, insulated doors; or a comparable product by one of the following:

1. Amweld International, LLC.
2. Curries Company; ASSA ABLOY.
3. Fleming Door Products Ltd.; Assa Abloy Group Company.
4. Gensteel Doors, Inc.
5. North American Door Corp.
6. Pioneer Industries.
7. Republic Doors and Frames.
8. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. (2.84 W/K x sq. m) when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. Doors:

- a. Type: Two-panel appearance as indicated in the Door and Frame Schedule on Drawings.
- b. Thickness: 1-3/4 inches (44.5 mm).
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
- d. Edge Construction: Model 2, Seamless.
- e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- f. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- g. Core: Polystyrene.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
- b. Construction: Full profile welded.

2.4 FRAME ANCHORS

A. Jamb Anchors:

- 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
- 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.5 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- B. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- C. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- D. Glazing: Comply with requirements in Section 088000 "Glazing."

2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 1. Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.
 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

- B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.

END OF SECTION 081113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Continuous, pin-and-barrel-type hinges.
2. Mortise locks.
3. Lock cylinders.
4. Operating trim.
5. Surface closers.
6. Wall- and floor-mounted stops.
7. Door gasketing.
8. Thresholds.
9. Metal protective trim units.
10. Auxiliary door hardware.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Door hardware schedule.
- C. Keying schedule.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
1. Scheduling Responsibility: Preparation of door hardware and keying schedule.
- B. Architectural Hardware Consultant Qualifications: A 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 who is currently certified by DHI as an Architectural Opening Consultant (AOC).

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three (3) years from date of Substantial Completion unless otherwise indicated below:
 - a. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC A117.1.

2.3 CONTINUOUS HINGES

- A. Continuous, Pin-and-Barrel-Type Hinges: ANSI/BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
 - 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.

- D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- E. Mortise Locks: ANSI/BHMA A156.13, Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
 - 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.5 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.
- B. Standard Lock Cylinders: ANSI/BHMA A156.5, Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Small Format, Interchangeable Core (SFIC).
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 6 construction master keys.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, appendix. Provide one extra key blank for each lock.
 - 1. Master Key System: Change keys and a master key operate cylinders.
 - a. Provide three cylinder change keys and five master keys.
 - 2. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - 3. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Brass.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.7 OPERATING TRIM

- A. Operating Trim: ANSI/BHMA A156.6; stainless steel unless otherwise indicated.
 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.8 SURFACE CLOSERS

- A. Surface Closers: ANSI/BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.9 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: ANSI/BHMA A156.16.
 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.10 DOOR GASKETING

- A. Door Gasketing: ANSI/BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.
- B. Maximum Air Leakage: When tested in accordance with ASTM E283/E283M with tested pressure differential of 0.3 inch wg (75 Pa), as follows:
 1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.

2.11 THRESHOLDS

- A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.12 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: ANSI/BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the basis of design product indicated in the door hardware schedule in Part 4.

2.13 FINISHES

- A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Heights: 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.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (760 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

- F. 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 will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- H. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 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.

3.3 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to completion of the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
 - 1. BE – Best Cylinder
 - 2. CO – Corbin Russwin
 - 3. CR – C.R. Laurence-Blumcraft
 - 4. DO – Dormakaba
 - 5. HA - Hager
 - 6. IN - Inox
 - 7. IV - Ives
 - 8. MK – McKinney
 - 9. NG – National Guard Products
 - 10. NO - Norton Rixson
 - 11. PE - Pemko
 - 12. RO – Rockwood
 - 13. SA - Sargent
 - 14. SC – Schlage
 - 15. VD – Von Duprin
 - 16. ZE – Zero International

PART 4 - HARDWARE SETS

Set 1.0: *Doors 100, 101, 104, 105 (HMG Door x HMG Frame)*

Burlington County Department of Resource Conservation

1 Continuous Hinge, Pin and Barrel	FM300-WEP	US32D	PE
1 Deadbolt Lock and Indicator Trim	B660P, IS-LOC, OS-LOC	US32D	SC
1 Cylinder Core, SFIC	IC 7-Pin	US26D	BE
1 Door Stop	RM861	US26D	RO
1 Door Handle	123x70C, 73C	US32D	RO
1 Door Closer	8501-M	689	NO
2 Kick Plate	K1050 8" 4BE	US32D	RO
1 Threshold	171Ax36"	Mill	PE
1 Door Bottom	3151SSN	US32D	PE
1 Gasketing	S88BL	Black	PE

Set 2.0: *Door 103 (HMG Door x HMG Frame)*

1 Continuous Hinge, Pin and Barrel	FM300-WEP	US32D	PE
1 Deadbolt Lock	B660P	US32D	SC
1 Cylinder Core, SFIC	IC 7-Pin	US26D	BE
1 Door Stop	RM861	US26D	RO
1 Door Handle	123x70C, 73C	US32D	RO
1 Door Closer	8501-M	689	NO
2 Kick Plate	K1050 8" 4BE	US32D	RO
1 Threshold	171Ax36"	Mill	PE
1 Door Bottom	3151SSN	US32D	PE
1 Gasketing (head/jamb)	S88BL	Black	PE

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass products.
 - 2. Laminated glass.
 - 3. Glazing sealants.
 - 4. Glazing tapes.
 - 5. Miscellaneous glazing materials.
- B. Glazing for transoms at door frames.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to 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. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Design Wind Pressures: 115-Vmph.
 2. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Acoustic Performance:
1. Exterior Glazing: 28 OITC.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they 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.

B. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 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; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks:

1. Silicone with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

C. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

D. Edge Blocks:

1. Silicone with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

- E. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. 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.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. 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 in accordance with requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. 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.
- E. Apply heel bead of elastomeric sealant.

- F. 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.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. 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.
- C. Installation with Drive-in Wedge Gaskets: 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 in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. 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 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.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at

frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 LAMINATED GLASS SCHEDULE

- A. Clear Laminated Glass Type: Two plies of fully tempered float glass.
1. Minimum Thickness of Each Glass Ply: 3 mm.
 2. Interlayer Thickness: 0.090 inch (2.29 mm).
 3. Safety glazing required.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

- A. Product data.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.4 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- C. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

3.2 FINISHING OF GYPSUM BOARD

- A. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:
 1. Level 5: Ceilings.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Setting material.
3. Grout materials.

1.2 ACTION SUBMITTALS

A. Product data.

B. Samples:

1. Full-size units of each type and composition of tile and for each color and finish required.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer employs only installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 PORCELAIN TILE

A. Porcelain Tile Type: Unglazed.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Crossville, Inc.; Speak Easy, Porcelain Stone.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 6 by 36 inches (147 by 894 mm).
4. Face Size Variation: Rectified.
5. Thickness: 7/16 inch (10.5 mm).
6. Product Use Classification: Interior, Dry (ID).
7. Tile Color, Glaze, and Pattern: As selected by Architect from manufacturer's full range.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Precoat with temporary protective coating.

2.3 SETTING MATERIALS

A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Laticrete International, Inc.
 - f. MAPEI Corporation.
 - g. TEC; H.B. Fuller Construction Products Inc.
2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.

2.4 GROUT MATERIALS

- ### A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Laticrete International, Inc.
 - f. MAPEI Corporation.
 - g. TEC; H.B. Fuller Construction Products Inc.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.

2.5 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.
- B. Temporary Protective Coating: Formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products and easily removable after grouting is completed without damaging grout or tile.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.

- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- C. Substrate Flatness:
 - 1. For tile shorter than 15 inches (381 mm), confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. (6.4 mm in 3 m) from the required plane, and no more than 1/16 inch in 12 inches (1.5 mm in 300 mm) when measured from tile surface high points.
 - 2. For large format tile, tile with at least one edge 15 inches (381 mm) or longer, confirm that structure or substrate is limited to 1/8 inch in 10 ft. (3 mm in 3 m) from the required plane, and no more than 1/16 inch in 24 inches (1.5 mm in 609 mm) when measured from tile surface high points.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM

- A. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in 1/3 offset pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- E. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
- F. Grout Sealer: Apply grout sealer to grout joints in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I: Thinset mortar.
 - a. Thinset Mortar: Modified dry-set mortar.
 - b. Grout: Water-cleanable epoxy grout.
 - c. Joint Width: 1/8 inch (3.2 mm).

END OF SECTION 093013

SECTION 096723 - RESINOUS FLOORING

GENERAL

1.1 SUMMARY

- A. Section includes decorative resinous flooring systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

Samples: For each type of exposed finish required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Basis-of-Design Product: Subject to compliance with requirements, provide Palma, Inc., a Palma, Manton Palma Company, PaliKrom 185; or comparable product by one of the following:

American Hi-Tech Flooring Company.

2. Arizona Polymer Flooring, Inc.
3. Atlas Minerals & Chemicals, Inc.; Polymer Flooring Division.
4. BASF Construction Chemicals, Inc.; BASF Building Systems.
5. ChemMasters.
6. CornerStone Flooring & Linings.
7. Crawford Laboratories Inc.; Florock.
8. Crossfield Products Corp.; Dex-O-Tex.
9. Crown Polymers, LLC.
10. Delta Polymers, Inc.
11. DUDICK Inc.
12. Dur-A-Flex, Inc.
13. Epoxy Systems, Inc.
14. ICS Garland Inc.
15. International Coatings Inc.
16. ITW Resin Technologies.
17. Key Resin Company.
18. Marbelite International Corp.
19. Micor Company, Inc.
20. NEOGARD; Division of JONES-BLAIR.
21. Northern Industries, Inc.
22. Nox-Crete Products Group.
23. Pacific Polymers, Inc.
24. POLY-CARB, Inc.
25. Polymerica, Incorporated.
26. PolySpec.
27. PPG Industries, Inc.
28. Protective Floorings & Linings, Inc.; a division of Chesterton.
29. RBC Industries, Inc.
30. ROCK-TRED Corporation.
31. Rust-Oleum Corporation.
32. Sauereisen.
33. Sherwin-Williams Company; General Polymers.
34. Specifier Products Inc.; Stonecarpet.
35. Stonhard, Inc.
36. Tamms Industries, Inc.; a division of The Euclid Chemical Company.
37. Tnemec Company, Inc.
38. Tufco International Inc.
39. Valspar Flooring.

2.2 MATERIALS

VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 DECORATIVE RESINOUS FLOORING

Resinous Flooring: Abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured for slip resistance.
3. Overall System Thickness: 3/16 inch (4.8 mm).

Federal Agency Approvals: USDA approved for food-processing environments.

C. Body Coats:

1. Resin: Epoxy.

Formulation Description: 100 percent solids.

3. Application Method: Self-leveling slurry.
 - a. Thickness of Coats: 1/16 inch (1.6 mm).
 - b. Number of Coats: Two.
4. Aggregates: Colored quartz (ceramic-coated silica).

Topcoat: Sealing or finish coats.

1. Resin: Epoxy.

Formulation Description: 100 percent solids.

3. Type: Clear.
4. Finish: Matte.
5. Number of Coats: One.

System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

Compressive Strength: 13,500-psi per ASTM C 579.

2. Tensile Strength: 1,750-psi per ASTM C 307.
3. Flexural Modulus of Elasticity: 7.03×10^6 per ASTM C 580.
4. Water Absorption: 0.37% per ASTM C 413.
5. Coefficient of Thermal Expansion: 1.9×10^{-5} in/in Deg F per ASTM C 531.
6. Indentation: 5.0% percent maximum per MIL-D-3134.

7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.
 8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
 9. Abrasion Resistance: 0.05 grams maximum weight loss per ASTM D 4060.
 10. Flammability: Self-extinguishing per ASTM D 635.
- Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.
12. Hardness: 83 average, Shore D per ASTM D 2240.
 13. Bond Strength: 535-psi, 100 percent concrete failure per ACI 503R.

System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM C 267 for immersion in the following reagents for no fewer than seven days:

1. Including, but not limited to, citric acid, fatty acid, lactic acid, nitric acid, calcium chloride, calcium hydroxide, sodium chloride, acetone, alcohol, ammonia, corn oil, gasoline, glycerine, fruit juices, vegetable juices, kerosene, lard, linseed oil, mayonnaise, milk, mineral spirits, mineral oils, motor oils, vegetable oils, peanut butter, vinegar and water.

2.4 ACCESSORIES

Primer: Type recommended by manufacturer for substrate and body coats indicated.

Formulation Description: 100 percent solids.

Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coats indicated and that prevents substrate cracks from reflecting through resinous flooring.

Formulation Description: 100 percent solids.

Provide fiberglass scrim embedded in reinforcing membrane.

- C. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

- b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

- a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.
 - b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- B. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
 - C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

Apply primer over prepared substrate at manufacturer's recommended spreading rate.

Apply reinforcing membrane to substrate cracks.

Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

1. Integral Cove Base: 6 inches high.

Apply self-leveling slurry body coats in thickness indicated for flooring system.

Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.

- G. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.
- H. Protect resinous flooring from damage and wear during the remainder of construction period.

END OF SECTION 096723

SECTION 099114 - EXTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and application of paint systems on the following exterior substrates:
 - a. Fiber-cement board.
 - b. Galvanized metal.
 - c. Plastic.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. M.A.B. Paints.
 - 4. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT PRODUCTS

- A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 INSTALLATION

- A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Cement Board Substrates:
 - 1. Latex System MPI EXT 3.3A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - 1) Sherwin-Williams Company (The); PrepRite ProBlock, B51W00620.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 1) Sherwin-Williams Company (The); Emerald, B47W00051.
- B. Galvanized-Metal Substrates:
 - 1. Alkyd System MPI EXT 5.3B:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.

- 1) Sherwin-Williams Company (The); Pro Industrial, Pro-Cryl Universal Primer, B66W310.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.
 - 1) Sherwin-Williams Company (The); Industrial and Marine, DTM Acrylic Semi-Gloss, B66W00211.
- C. Plastic Trim Fabrication Substrates:
 - 1. Latex System MPI EXT 6.8A:
 - a. Prime Coat: Primer, bonding, water based, MPI #17.
 - 1) Sherwin-Williams Company (The); PrepRite ProBlock, B51W00620.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 1) Sherwin-Williams Company (The); Emerald, B47W00051.

END OF SECTION 099114

SECTION 099124 - INTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Galvanized metal.
 - 2. Gypsum board.
 - 3. Concrete masonry units (CMU)

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. M.A.B. Paints.
 - 4. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
- C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 - 1. Alkyd System MPI INT 4.2C:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - 1) Sherwin-Williams Company (The); PrepRite, B25W00025.
 - b. Sealer Coat: Primer sealer, latex, interior, MPI #50.
 - 1) Sherwin-Williams Company (The); ProMar 200, B28W08200.
 - c. Intermediate Coat: Alkyd, interior, matching topcoat.
 - d. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

- 1) Sherwin-Williams Company (The); ProMar 200, B34W02251.

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System MPI INT 5.3B:

- a. Prime Coat: Primer, galvanized, water based, MPI #134.

- 1) Sherwin-Williams Company (The); Pro Industrial, Pro-Cryl Universal Primer, B66W310.

- b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.

- c. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.

- 1) Sherwin-Williams Company (The); Industrial and Marine, DTM Acrylic Semi-Gloss, B66W00211.

C. Gypsum Board Substrates:

1. Alkyd over Latex Sealer System MPI INT 9.2C:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.

- 1) Sherwin-Williams Company (The); ProMar 200, B28W08200.

- b. Intermediate Coat: Alkyd, interior, matching topcoat.

- c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

- 1) Sherwin-Williams Company (The); ProMar 200, B34W02251.

END OF SECTION 099124

SECTION 101423 - PANEL SIGNAGE

GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs for exterior locations to be used for toilet room identification as depicted on the Drawings. Total quantity of six (6) panel signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

Samples: For each exposed product and for each color and texture specified.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty:** Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- B. Accessibility Standard: Comply with applicable provisions in ICC A117.1 for signs.

2.2 SIGNS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. Advance Corporation.
3. Allen Industries Architectural Signage.
4. Allen Markings.
5. APCO Graphics, Inc.
6. ASE, Inc.
7. ASI Sign Systems, Inc.
8. Best Sign Systems, Inc.
9. Clarke Systems.
10. Inpro Corporation.
11. Mohawk Sign Systems.
12. Nelson-Harkins Industries.

Room-Identification Sign (see Building Elevations): Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic (UVF) or phenolic backing sheet to produce composite sheet.

- a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).

Color(s): As selected by Architect. Braille Signage shall be produced by a certified Braille Signage Manufacturer using standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

- d. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

Sign-Panel Perimeter: Finish edges smooth.

- a. Edge Condition: Square cut.
- b. Corner Condition in Elevation: Square.

3. Mounting: Surface mounted to wall with countersunk flathead, stainless-steel through fasteners.
4. Provide men's/ladies'/family pictogram signs with text at toilet room doors 100, 101, 104 and 105. Provide the "international symbol of accessibility" for signs. The size of signs indicated at these locations shall be 10-inches high x 10-inches wide.
5. Provide men's/ladies' pictogram signs with text and directional arrows to toilet room doors. Provide the "international symbol of accessibility" for signs. The size of signs indicated at these locations shall be 10-inches high x 10-inches wide.

2.3 PANEL-SIGN MATERIALS

Acrylic Sheet: ASTM D 4802, Type UVF (UV filtering).

- B. Polycarbonate Sheet: Coated, mar-resistant, UV-stabilized polycarbonate, with coating on both sides.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. For exterior exposure, furnish stainless-steel fasteners unless otherwise indicated.
 2. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed stainless-steel fasteners, with type of head indicated, installed in predrilled holes.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

EXECUTION

3.1 INSTALLATION

General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign 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.
- B. Mounting Methods:
1. 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.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Childcare accessories.
 - 3. Underlavatory guards.
 - 4. Custodial accessories.

1.2 ACTION SUBMITTALS

- A. Product data.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers 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 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser “B”:

1. Bobrick Washroom Equipment, Inc.; B-4288
2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for 5-inch- (127-mm-) diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

- B. Waste Receptacle “H”:

1. Bradley Company, LLC; 3A05
2. Mounting: Open top, recessed.
3. Minimum Capacity: 12-gallon.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Liner: Reusable vinyl liner.
6. Lockset: Tumbler type for waste receptacle.

- C. High-Speed Air Hand Dryer “D”:

1. Xlerator Hand Dryer; XL-SB-H-1.1N-40502/40505>
2. Description: High-speed, unheated-air hand dryer for rapid hand drying.
3. Mounting: Semirecessed.
 - a. Protrusion Limit: Installed unit protrudes maximum 4 inches (102 mm) from wall surface.
4. Operation: Infrared-sensor activated with timed power cut-off switch.
 - a. Average Dry Time: 12 seconds.
 - b. Automatic Shutoff: At 60 seconds.
5. Maximum Sound Level: 64 dB.
6. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Electrical Requirements: 115 V, 13 A, 1500 W.

- D. Soap Dispenser “G”:

1. Bobrick Washroom Equipment, Inc.; B-8221
2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
3. Mounting: Deck mounted on lavatory.
4. Capacity: 20 fl.-oz.

5. Materials: Type 304 stainless steel with bright, polished finish.

E. Grab Bar "A":

1. Bobrick Washroom Equipment, Inc.; B-6806.99
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. OD: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

F. Mirror Unit "C":

1. Bobrick Washroom Equipment, Inc.; B-2908-2436, tempered glass
2. Frame: Stainless steel angle, 0.05 inch (1.3 mm) thick.
 - a. Corners: Welded and ground smooth.
3. Size: 24-inches x 36-inches.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

2.3 CHILDCARE ACCESSORIES

A. Diaper-Changing Station "E":

1. Koala Care Products, a Division of Bobrick; KB-310-SSWM and 310-54-KIT stainless steel bag hook
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support minimum of 250 lb (113 kg) static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), exterior shell; HDPE interior in manufacturer's standard color.
6. Liner Dispenser: Provide built-in dispenser for disposable sanitary liners.

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard, All Piping Below All Lavatories:

1. IPS Corporation, Lav Guard 2, Undersink Piping Covers

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Custodial Mop and Broom Holder for Plumbing Chase 103:

1. Bobrick Washroom Equipment, Inc.; B-239x34
2. Description: Unit with shelf, hooks and holders beneath shelf.
3. Length: 34 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

2.6 FABRICATION

- ### A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- #### A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
1. Remove temporary labels and protective coatings.
- #### B. Grab Bars: Install to comply with specified structural-performance requirements.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers 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 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
 - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

- B. Multipurpose Dry-Chemical Type “FE-1”: UL-rated 4A-80BC, 10-lbs. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS “FE-1”

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Height: Top of fire extinguisher to be at 42 inches (1067 mm) above finished floor.

END OF SECTION 104416

SECTION 108000 SITE AMENITIES

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF 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. MOUNTED DIRECTIONAL SIGN
 - 2. MOUNTED SITE SIGNAGE
 - 3. VEHICULAR DIRECTIONAL SIGNAGE
 - 4. RECYCLED PLASTIC PARKING STRIP
 - 5. PET WATER FOUNTAIN

1.03 RELATED SECTIONS

- A. Earthwork
- B. Fence and Wood Structures

1.04 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 Landscape 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.

1.05 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 Landscape Architect for consideration. If he does so, he must include a complete comparison of each component and aspect of the specified item versus the proposed substitution including a price clarification for such substitutions. Any substitution must be approved in writing by the Landscape Architect.

1.06 QUALITY ASSURANCE

- A. Site Amenities work must be done by a single firm specializing in the work.

1.07 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.
- 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete work as rapidly as portions of the site become available.
- B. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- C. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- D. Do not commence work until all utility lines, backfilling and grading has been completed. Site amenities must be properly coordinated with pavement installation.
- E. Clean-up and Protection
 - 1. Keep pavements clean and work area in an orderly condition.
 - 2. Protect site amenities work and materials from damage due to operations by other contractors, trades and trespassers.
 - 3. Repair or replace damaged materials as directed by the Landscape Architect.

1.09 INSPECTION AND ACCEPTANCE

- A. When site amenities work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.
- B. Site amenities may be inspected for acceptance in parts agreeable to the Landscape Architect, provided work offered for inspection is complete.

- C. When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

1.10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than one (1) year from the date of final acceptance by the Landscape Architect, or as required by the contract documents.

PART 2 – PRODUCTS

2.01 MOUNTED DIRECTIONAL SIGN

2.02 MOUNTED SITE SIGNAGE

2.03 VEHICULAR DIRECTIONAL SIGNAGE

- A. The sign support materials shall be as shown on the plans or as approved by the landscape architect. Contractor to provide detailed shop drawings of materials, fasteners, fittings etc. prior to fabrication.
- B. The signs shall be as shown on the plans, as manufactured by Alpha One Studios, or approved equal. Colors and graphics to match existing signs when present. The signs shall be fabricated from 18-pound, polyurethane core stock design board, sandblasted to a minimum depth of 1 ½", in the general design shown on the plans. The text and graphics shown are informational only, final copy to be provided by Owner. The Park Entrance Sign shall be 2-sided, all others are one-sided.
- C. Shop drawings and color samples shall be submitted to the landscape architect for approval prior to fabrication. This shall include layout, mounting, attachment hardware, epoxy, etc. as recommended by the manufacturer, and supplied by the contractor.
- D. The sign base shall receive 2 coats of Finneran & Haley latex primer and 3 coats Finneran & Haley outdoor stain. Raised areas shall receive 1 coat surface primer, and 3 coats of Finneran & Haley House & Trim latex paint. Raised surfaces shall be lightly sanded between coats to ensure proper adhesion.

2.04 RECYCLED PLASTIC PARKING STRIP

- A. The materials for parking bumpers shall be as shown on the plans or as approved by the landscape architect. The sizes and colors shall be as shown on the plans, and as approved by the landscape architect. Materials shall be as specified by the Best Plus or approved equal, and are incorporated herein by reference.

2.05 PET WATER FOUNTAIN

- A. Pet Station Model #320 SM as manufactured by Most Dependable Fountains or approved equal. Color: To be selected from manufacturer's full range.
- B. Connect drain to restroom downspout drainage piping.
- C. Potable water connection as indicated on restroom plumbing drawings. Provide provisions for winterization.

PART 3 – EXECUTION

3.01 MOUNTED DIRECTIONAL SIGN

3.02 MOUNTED SITE SIGNAGE

3.03 VEHICULAR DIRECTIONAL SIGNAGE

- A. All Signs shall be located as shown on the drawings or installed per manufacturer's recommendations in locations to be directed by the Landscape Architect.
- B. Final sign text, graphics and layout will be provided by Landscape Architect. Contractor shall provide shop drawing to Landscape Architect of Sign attachment for approval prior to installation.
- C. When fully installed, Signs shall be level, firmly attached, secure and free of any play whatsoever. All connectors shall be firmly tightened and Signs shall be free of any marks, dents, holes, etc. resulting from transportation to the site and actual on-site construction.

3.04 RECYCLED PLASTIC PARKING STRIP

- A. The parking bumpers shall be installed as shown on the plans, and as specified by the manufacturer.
- B. When fully installed, Signs shall be level, firmly attached, secure and free of any play whatsoever. All connectors shall be firmly tightened and Signs shall be free of any marks, dents, holes, etc. resulting from transportation to the site and actual on-site construction.

3.05 PET WATER FOUNTAIN

- A. The PET WATER FOUNTAIN shall be constructed in accordance with the plans and specifications, including manufacturer's associated specifications.
- B. When fully installed, the PET WATER FOUNTAIN shall be level, firmly attached, secure and free of any play whatsoever. All connectors shall be firmly tightened and shall be free of any marks, dents, holes, etc. resulting from transportation to the site and on-site construction.

PART 4 – PAYMENT

4.01 MOUNTED DIRECTIONAL SIGN

4.02 MOUNTED SITE SIGNAGE

4.03 VEHICULAR DIRECTIONAL SIGNAGE

- A. Quantity: The quantities for which payment will be made for SITE SIGNAGE will be the number of various units actually constructed as specified, in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the quantities as above determined, at the unit prices bid in the Proposal for the various items, which price shall include the cost of furnishing, assembling and installing the items, attachment, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.04 RECYCLED PLASTIC PARKING STRIP

4.05 PET WATER FOUNTAIN

- A. Quantity: The quantities for which payment will be made will be the number of various units actually constructed as specified, in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the quantities as above determined, at the unit prices bid in the Proposal for the various items, which price shall include the cost of furnishing, assembling and installing the items, attachment, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 108000 SITE AMENITIES

SECTION 129300 SITE FURNISHINGS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF 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. Reinstalled site furniture

1.03 RELATED SECTIONS

- A. Earthwork
- B. Site Concrete

1.04 SUBMITTALS

- A. Certification
 - 1. General
 - a. Certificates of inspection as required by governmental authorities.
 - b. Other data substantiating that the 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 Landscape 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.

1.05 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 Landscape Architect for consideration. If he does so, he must include **a complete comparison of each component and aspect of the specified item versus the proposed substitution including a** price clarification for such substitutions. **Any substitution must be approved in writing by the Landscape Architect.**

1.06 QUALITY ASSURANCE

- A. Site Furnishings work must be done by a single firm specializing in the work.

1.07 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.
- 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete, site furnishings work as rapidly as portions of the site become available.
- B. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- C. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- D. Do not install site furnishings until after all utility lines, backfilling and grading has been completed. Site furnishings must be properly coordinated with pavement installation.
- E. Clean-up and Protection
 - 1. During site furnishings work keep pavements clean and work area in an orderly condition.
 - 2. Protect site furnishings work and materials from damage due to operations by other contractors, trades and trespassers.
 - 3. Repair or replace damaged materials as directed by the Landscape Architect.

1.09 INSPECTION AND ACCEPTANCE

- A. When site furnishings work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.
- B. Site furnishings may be inspected for acceptance in parts agreeable to the

Landscape Architect, provided work offered for inspection is complete.

- C. When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

1.10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than one (1) year from the date of final acceptance by the Landscape Architect.

PART 2 - PRODUCTS

2.01 Reinstalled site furniture

- A. **Utilize existing on-site furniture.**

PART 3 - EXECUTION

3.01 RELOCATED SITE FURNITURE

- A. SITE FURNITURE shall be located as shown on the drawings and shall be installed as per manufacturer's recommendations.
- B. When fully installed, site furniture shall be level, firmly attached, secure and free of any play whatsoever.
- C. All connectors shall be firmly tightened and the site furniture shall be free of any marks, dents, holes, etc. resulting from transportation to the site and actual on-site construction.

PART 4 PAYMENT

4.01 REINSTALLED LITTER/RECYCLE RECEPTACLES

- A. Payment: No separate payment shall be made for reinstalled litter/recycle receptacles as part of this specification section. Payment for work included in this specification section shall be included in the Site Clearing/Demolition bid items from the work described in this specification section.

END OF SECTION 129300 SITE FURNISHINGS

SECTION 220000 - GENERAL PROVISIONS FOR PLUMBING WORK

PART 1 - GENERAL

1.01 RELATED WORK

- A Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.
- B Drawings and general provisions of Contract, including General Conditions, and Division 01 Specification Sections apply to work of this Section.

1.02 WORK INCLUDED

- A The work covered by this section includes the construction described in the Contract Documents including all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction, and all services, facilities, tools and equipment necessary or used to perform and complete such construction. The work includes, but is not limited to the following:
 - 1. Domestic Water Systems.
 - 2. Soil, Waste, Vent and Storm Water Systems.
 - 3. Piping, Valves and Fittings
 - 4. Water Meters and Backflow Prevention Devices
 - 5. Insulation.
 - 6. Domestic Water Heaters.
 - 7. Identification System.
 - 8. Hangers, Supports and Guides.
- B Related Work not Included in this Division but Specified Elsewhere
 - 1. Finish painting, except for prefinished equipment or as otherwise specified.
 - 2. Concrete work, except equipment inertia and floating bases.
 - 3. Base flashing for piping and drains.
 - 4. Toilet accessories.

5. Waterproofing.
6. Installation of access doors and frames.

1.03 DEFINITIONS

- A "Provide": to supply, install, and make complete, safe, and operable, the particular work referred to unless specifically indicated otherwise.
- B "Install": to erect, mount, and make complete with all related accessories.
- C "Furnish" or "supply": to purchase, procure, acquire, and deliver complete with related accessories.
- D "Work": labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.
- E "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation and all related accessories.
- F "Wiring": raceway, fittings, wire, boxes and all related accessories.
- G "Indicated," "shown," or "noted": as indicated, shown, or noted on drawings or specifications.
- H "Similar" or "equal": of base bid manufacture, equal in quality materials, weight, size, performance, design, and efficiency of specified prof, conforming with "Base Bid Manufacturers."
- I "Reviewed" "satisfactory," "accepted," or "directed": as reviewed, satisfactory, accepted, or directed by Architect and/or Engineer.
- J "Motor Controllers": manual or magnetic starters with or without switches, individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- K "Control or Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, flow, operation of equipment.
- L Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- M Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- N Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

- O Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- P Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- Q The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. NP: Nylon plastic.
 - 4. PE: Polyethylene plastic.
 - 5. PVC: Polyvinyl chloride plastic.
- R The following are industry abbreviations for rubber materials:
 - 1. CR: Chlorosulfonated polyethylene synthetic rubber.
 - 2. EPDM: Ethylene propylene diene terpolymer rubber.

1.04 COORDINATION OF WORK

- A The plumbing drawings show the general arrangement of piping and appurtenances. Follow these drawings as closely as the actual construction will permit. Conform the plumbing work to the requirements shown on the drawings. Provide offsets, fittings, and accessories, which may be required but not shown on the drawings. Investigate the site, structural and finish ground conditions affecting the work, and arrange the work accordingly. Provide such work and accessories as may be required to meet such conditions.
- B Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
- C Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings.
- D Transmit to other trades all information required for work to be provided under their sections, in ample time for installation.
- E Wherever work interconnects with work specified of other trades, coordinate with the General Contractor to insure that all necessary information is presented so that all the necessary connections and equipment may be properly installed. Identify all items

(valves, piping, equipment, etc.) in order that the General Contractor know where to install access doors and panels.

- F Consult with other trades regarding equipment so that, wherever possible, motors, motor controls, pumps and valves are of the same manufacturer.
- G Furnish and set all sleeves for passage of pipes and conduits through structural masonry and concrete walls and floors and elsewhere as will be required for the proper protection of each pipe passing through building surfaces.
- H Provide required supports and hangers for piping and equipment, designed so as not to exceed allowable loadings of structures.
- I Examine and compare the contract drawings and specifications with the drawings and specifications of other disciplines, and report any discrepancies between them to the General Contractor and obtain from him written instructions for changes necessary in the work of this Section. Install and coordinate the work of this section in cooperation with installing interrelated work. Before installation, take proper provisions to avoid interferences. All changes required in the work of the contractor, caused by his neglect to do so, to be made by him at his own expense.
- J Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar to that of the design drawings, prepared on tracing medium of the same size as contract drawings. With these layouts, coordinate the work with the work of the contractor. Such detailed work is to be clearly identified on the drawings as to the area to which it applies. Submit these drawings to the Engineer for review. At completion, however, include a set of such drawings with each set of as-built drawings. When directed by the Engineer, submit drawings for review, clearly showing the work of this section and its relation to the work of other disciplines before commencing shop fabrication or erection in the field.
- K Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship and report any conditions, which prevent performance of first class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.
- L Provide required anchor bolts, sleeves, inserts and supports. Direct location of anchor bolts, sleeves, inserts and supports to insure that they are properly installed. Any expense resulting from the improper location or installation of anchor bolts, sleeves, inserts and supports to be paid for by the contractor.
- M Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. Properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.

- N Adjust location of pipes, panels, equipment, etc., to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each pipe prior to fabrication.
 - 1. Right-of-Way: Lines, which pitch has the right-of-way over those that do not pitch, i.e., plumbing drains. Lines whose elevations cannot be changed have right-of-way over lines whose elevations can be changed.
 - 2. Make offsets, transitions and changes in direction in pipes as required to maintain proper head room and pitch on sloping lines whether or not indicated on the drawings. Furnish and install all traps, air vents, drains, etc., as required to affect these offsets, transitions and changes in direction.
- O Install all plumbing work to permit the removal (without damage to other parts) of water heaters and all other equipment requiring periodic replacement or maintenance. Arrange pipes and equipment to permit access to valves, cocks, starters, motors, and control components, and to clear the openings of swinging doors and access panels.
- P Provide access panels in equipment as required for inspection and maintenance of internal parts, etc.
- Q The contractor shall coordinate his work with the work of other trades.
- R Coordinated Composite Drawings
 - 1. The Contractor shall prepare full coordinated composite drawings for the mechanical, electrical and fire protection trades. The Contractor shall overlay each trade's work (in separate colors) on a sepia set of sheetmetal drawings. All conflicts and potential conflicts shall be clearly identified on the sepia sheetmetal drawings. This shall include but not be limited to conflicts with lights, equipment, piping, ductwork and supports of other trades, as well as conflicts with architectural and structural walls, columns, ceilings and structural beams. Contractor shall have representatives of each trades, as well as conflicts with architectural and structural walls, columns, ceilings and structural beams. Contractor shall have representatives of each trade attend a weekly job site coordination meeting in the Contractor's field office. All trades shall resolve conflicts at these meetings and sign off each sepia sheetmetal drawing indicating acceptance and satisfactory resolution to all conflicts. All conflicts that cannot be resolved shall be brought to the attention of the Engineer for resolution.

1.05 USE OF SITE AND LOAD LIMITATIONS

- A The contractor shall review all available data on the location and types of pipelines and other underground utilities. The contractor shall not operate equipment over the facilities and shall take care not to damage them or otherwise impair their use. The

contractor shall make investigation to verify the location of these facilities before proceeding with construction and/or operations in their vicinity.

1.06 CONTRACTOR'S RESPONSIBILITY FOR EVALUATION

- A The Engineer and Owner make no representations, regarding the character or extent of the subsoils, water levels, existing structural, mechanical and electrical installations, above or below ground or other subsurface conditions which may be encountered during the Work. The contractor must make his own evaluation of existing conditions, which may affect methods or cost of performing the Work, based on his own examination of the facility or other information. Failure to examine the drawings or other information shall not relieve the contractor of his responsibility for satisfactory accomplishment of the Work.
- B The locations of existing services are believed to be as indicated on the plans. The contractor shall verify the location of these services prior to commencing any work and notify the Engineer of any discrepancies.

1.07 ACCESS TO FIRE PROTECTION EQUIPMENT

- A The contractor shall not interfere with access to hydrants, fire exits, fire hose stations, fire extinguishers and fire alarm pull stations. In no case shall the contractor's material or equipment be within twenty-five (25) ft of a hydrant or fire alarm pull station.

1.08 EQUIPMENT AND MATERIALS

- A If products and materials are specified or indicated on the drawings for a specific item or system, the contractor shall use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, in accordance with shop drawings.
- B All products and materials shall be new, clean, free of defects and free of damage and corrosion.
- C No permanent equipment shall be used to provide temporary services during construction.
- D Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain replacement or repair.
- E Make certain that all materials selected directly, or by suppliers, conform to the requirements of the contract drawings and specification. Transmittal of such specifications and drawings, information to persons manufacturing and supplying

materials to the project, and rigid adherence thereto, is the Contractor's responsibility. Acceptance of a manufacturer's name by the Engineer does not release the Contractor of the responsibility for providing materials, which comply in all respects with the requirements in the Contract Documents.

- F Applicable equipment and materials to be listed by Underwriters' Laboratories and Manufactured in accordance with ASME, AWWA, or ANSI standards, and as approved by local authorities having jurisdiction.
- G Fully lubricate all equipment when installed and prior to final acceptance.
- H Do not operate water systems until piping has been tested and cleaned.
- I Secure equipment with bolts, washers and locknuts of ample size to support equipment. Embedded anchor bolts to have bottom plate and pipe sleeves. Grout all machinery set in concrete under the entire bearing surface. After grout has set, remove all wedges, shims and jack bolts and fill space with grout.
- J Locate valves, traps, access doors, etc., to be easily accessible, either in mechanical spaces or through access panels specified herein.
- K Follow manufacturers' instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the Engineer before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special valves, piping, wiring and accessories.

1.09 QUALITY ASSURANCE

A Codes, Standards and Fees

- 1. Codes and Standards:
 - a. Comply with all current governing codes, ordinances and regulations, UL and all other applicable codes.
 - b. Comply with the requirements of the State adopted Building Code, and other agencies or authorities having jurisdiction over any part of the Work and secure all necessary permits.
 - c. Where codes or standards are listed herein, the applicable portions apply.
 - d. Plans, specifications, codes and standards are all minimum requirements. Where requirements differ, apply the more stringent.
 - e. Should any change in plans or specifications be required to comply with governing regulations, the contractor is to notify the Engineer at the pre-bid meeting.
 - f. The codes and standards listed in the Specifications can be obtained from the organizations listed as follows:
 - 1) Occupational Safety and Health Act
 - 2) American National Standard Institute, Inc.
 - 3) American Society of Mechanical Engineers

- 4) American Society for Testing and Materials
 - 5) American Water Works Association
 - 6) Underwriters Laboratories, Inc.
 - 7) American Society of Heating, Refrigerating and Air Conditioning Engineers
 - 8) National Electrical Manufacturers Association
 - 9) American Insurance Association
 - 10) American Welding Society
 - 11) American Standards Association
 - 12) Institute of Electrical and Electronics Engineers
 - 13) National Electrical Code
- g. The particular specification will be identified by appropriate prefix and number only with the latest revision being applicable unless otherwise noted.

2. Fees

- a. Pay all required fees.
 - b. Pay royalties or fees required in connection with the use of patented devices and systems.
- B Furnish all materials and equipment new, free from defects and with listings or labels of Underwriter's Laboratories, Inc. or other nationally approved testing laboratory.
- C All items of a given type shall be the product of the same manufacturer.
- D All materials and equipment shall be the product of manufacturers regularly engaged in their manufacture.

1.10 SHOP DRAWINGS

- A Prepare and submit detailed shop drawings for piping work and other distribution services, including locations and sizes of all openings in floor walls and roofs.
- B The work described in any shop drawing submission to be carefully checked for all clearances (including those required for maintenance and servicing), field conditions, maintenance of architectural conditions and proper coordination with all trades on the job. Each submitted shop drawing to include a certification that all related job conditions have been checked and that no conflict exists.
- C All drawings to be submitted sufficiently in advance of field requirements to allow ample time for checking. All submittals to be complete and contain all required and detailed information. Shop drawings with multiple parts to be submitted as a package.
- D If submittals differ from the Contract Document requirements, make specific mention of such difference in a letter of transmittal, with request for substitution, together with reasons for same.

- E Review of any submitted data or shop drawings for material, equipment apparatus, devices, arrangement and layout shall not relieve the contractor from responsibility of furnishing same of proper dimensions and weight, capacities, sizes, quantity, quality and installation details to efficiently perform the requirements and intent of the Work. Such review shall not relieve the contractor from responsibility for errors, omissions or inadequacies of any sort on submitted data or shop drawings.
- F Each shop drawing is to contain the job title, the names and phone numbers of the General Contractor and the contractor, references to the applicable design drawing or specification article, date and scale.
- G Within fifteen (15) days after award of Contract, submit for review, a list of all material and equipment manufacturers whose products are proposed, as well as names of all Subcontractors whom the General Contractor proposes to employ.
- H Within three (3) weeks after award of Contract, submit a list of all shop drawings, which will be submitted in the course of the project. List to show disposition of each item, including date of submission, review, and the like. List to be kept up-to-date throughout entire construction period.
- I Submit shop drawings and manufacturer's data for the following items in accordance with the Contract Documents:
 - 1. Coordinated, detailed shop layout drawings of all mechanical rooms, services and distribution systems, including plans, profiles and sections.
 - 2. Hangers, supports, inserts, anchors, guides and foundations.
 - 3. Valves.
 - 4. Equipment and piping layouts at 3/8 in. scale for the building.
 - 5. Schedule of pipe and fittings, materials and application, valves, escutcheons, air vents, valve tags and schedules, strainers, and water specialties.
 - 6. Water heaters and accessories.
 - 7. Plumbing fixture and trim.
 - 8. Other shop drawings and submittals as requested within the specification.

1.11 SAMPLES

- A Submit samples of all items with exposed finishes for review.
- B Allow sufficient time for consideration without interfering with job schedule.

- C Duplicate quality and finish to type to be supplied under contract.
- D Identify similar to shop drawings.

1.12 START-UP

- A Properly lubricate all pieces of equipment.
- B Check and clean all pipes of dirt and debris, including strainers.
- C Prepare each piece of equipment in accordance with manufacturer's installation instructions and have a copy at the equipment.
- D Fill and vent all water systems.
- E Have representatives of each manufacturer present when hereinafter specified, so that equipment will be started up by manufacturer.

1.13 SYSTEM IDENTIFICATION

- A Piping:
 - 1. All piping, exposed or concealed shall be identified as to its service in accordance with OSHA and ANSI Standards by one of the following methods:
 - a. Installation of manufactured adhesive band type identification markers, similar to "Quick-Label" by W.H. Brady Company.
 - 2. Piping identification markings shall be installed as follows:
 - a. In each room.
 - b. All valve locations.
 - c. At shaft walls.
 - d. Every 40 feet on continuous runs.
 - 3. Valves:
 - a. Valves shall be identified by a tag system utilizing brass tags at 2 inch minimum diameter and attached to the valves using brass chain.
 - 1) The new valve tag identification numbers shall be permanently added to all existing valve tag charts within the building.

1.14 OPERATING & MAINTENANCE INSTRUCTION

- A Prepare operating and maintenance instructions manual including operating instructions, maintenance instructions, manufacturer's data, specific equipment data.

- B Provide an alphabetical list of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
- C Provide operating instructions for complete system, including:
 - 1. Normal starting, operating, and shut-down
 - 2. Emergency procedures for fire or failure of major equipment
 - 3. Summer and winter special procedures
 - 4. Day and night special procedures
- D Provide maintenance instructions, including:
 - 1. Valve tag list and equipment tag list
 - 2. Proper lubricants and lubricating instructions for each piece of equipment, and date when lubricated
 - 3. Required cleaning, replacement and/or adjustment schedule
- E Provide manufacturer's data on each piece of equipment, including:
 - 1. Installation instructions.
 - 2. Drawings and specifications.
 - 3. Parts list, including recommended items to be stocked.
 - 4. Complete wiring and temperature control diagrams.
 - 5. Marked or revised prints locating all concealed parts and all variations from the original system design.
 - 6. Test and inspection certificates.
- F Provide specific equipment data including, but not limited to, the following:
 - 1. For Plumbing Systems:
 - a. Valves.
 - b. Piping.
 - c. Accessories.
 - d. Water heaters.
 - e. Water meters.
 - f. Toilet fixtures and supports.
 - g. Flow measuring devices.

h. Electric wiring.

G Provide instruction of operating personnel.

1. Instruct Owner's operating personnel in proper starting sequences, operation, shutdown, and maintenance procedures, including normal and emergency procedures.
2. Instruction to be by personnel skilled in operation of equipment. Instructions for major equipment to be by equipment manufacturers' representatives.
3. Make arrangements to give instructions by system and not by building areas.
4. Provide five (5) instruction sessions not to exceed six (6) hours each.
5. Instructions on automatic controls to be by manufacturer's representative.

H Submittals

1. Shop Drawings: Submit three copies for review prior to final issuance.
2. Provide six (6) copies of each operation and maintenance manual.
 - a. Manuals to be 8-1/2" x 11 size in hard-back, 3-ring loose leaf binders. Use more than one volume if required. Do not overfill binders.
 - b. Manuals to be completed and delivered to the Engineer for approval at least 20 days prior to instruction of operating personnel.
3. Prepare separate manuals for the Plumbing system.

1.15 TOOLS FOR OPERATION, ADJUSTMENT AND MAINTENANCE

- A Deliver to Owner's representative all special tools needed for proper operation, adjustment and maintenance of equipment.

1.16 RECORD DRAWINGS

- A The contractor shall maintain a complete set of "Record Drawings" reflecting an accurate dimensional record of all work. These drawings shall be marked up to show the precise location of concealed work and equipment, including concealed piping and valves and all changes and deviations in the plumbing work from that shown on the contract drawings. This requirement shall not be construed as authorization for the contractor to make changes in the layout or work without written definite instruction from the Architect or Engineer.
- B Record dimensions shall clearly and accurately delineate the work as installed; location shall be suitably identified by at least two dimensions to permanent structures.

- C The contractor shall stamp all "Record Drawings" and certify for correctness by signing and dating them.
- D Record drawings submitted to Owner shall consist of 1 set of mylars and 1 set of compact disk's (CD's) with all work provided on Autocad 2000 format.
- E Prior to final acceptance, contractor shall submit certified "Record Drawings" to the Architect/Engineer for review and make changes, corrections or additions as noted by Architect/Engineer. After this review, the drawing shall be delivered to the Owner.

PART 2 PRODUCTS

2.01 BASE BID MANUFACTURERS

- A Base bid on materials or equipment are specified by name of manufacturer, brand or trade name and catalog reference.
- B Refer to Division 01 Specifications for substitutions.
- C The following are base bid manufacturers for items under this Section:
 - 1. Inserts: F and S Mfg Co., Fee and Mason and Grinnell.
 - 2. Hangers and supports: I.T.T. Grinnell, Carpenter and Patterson, Inc., and Fee & Mason.

2.02 2.2 INSERTS AND SUPPORTS

- A Provide trapeze hangers of bolted angles or channels for grouped lines and services.
- B Provide additional framing where building construction is inadequate. Submit for review.
- C Inserts shall be steel, slotted type and factory-painted.
 - 1. Single rod shall be similar to Grinnell Fig. 281.
 - 2. Multi-rod shall be similar to Fee & Mason Series 9000 with end caps and closure strips.
 - 3. Clip form nails flush with inserts.
 - 4. Maximum loading including pipe, contents and covering shall not exceed 75 percent of rated insert capability.
- D Supports from steel decks:

1. Pipes:
 - a. Maximum size: 2-inch diameter.
 - b. Hanger spacing: maximum 10-feet centers.

2.03 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS:

- A Connect supplementary steel and channels firmly to building construction in an acceptable manner.
- B Determine type and size of supporting channels and supplementary steel. Supplementary steel and channels shall be of sufficient strength and size to allow only a minimum deflection in conformance with manufacturer's requirements of loading.
- C Install supplementary steel and channels in a neat and workmanlike manner parallel to walls, floors, and ceiling construction.
- D All supplementary steel, channels, supports shall be submitted to Structural Engineer for review.

2.04 EXPANSION ANCHORS

- A Provide smooth wall, non-self-drilling internal plug expansion type anchors constructed of AISC 12L14 steel and zinc plated in accordance with Fed. Spec. QQ-A-325 Type 1, Class 3.
- B Do not exceed 1/4 of average values for a specific anchor size using 2000 psig concrete only, for maximum working load.
- C Provide spacing and install anchors in accordance with manufacturer's recommendations.

2.05 ACCESS DOORS

- A Refer to Division 08 Specifications for requirements.

2.06 ACCESS TILE IDENTIFICATION:

- A In removable ceiling tiles, provide buttons, tabs, and markers to identify location of concealed work. Submit for review.

2.07 NAMEPLATES

- A Provide nameplates with inscriptions, subject to review, indicating equipment and voltage. Fasten with epoxy cement or chrome plated screws. Nameplate shall be black Lamicoid sheet with white lettering.
- B Provide nameplates for gauges, meters, instruments, control devices, pilot lamps, transmitters, motor controllers and panel mounted equipment.

PART 3 EXECUTION

3.01 COORDINATION

- A The Contractor shall assure full cooperation of all trades and shall furnish in writing all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B Prepare coordinated composite drawings at a suitable scale not less than 1/4-inch equals one foot, zero inches, clearly showing how the work of this Division is to be installed in relation to the work of all trades. Any work installed in conflict with the work of other trades shall be corrected at no additional cost to the Owner.

3.02 THE CONTRACTOR MAY, SUBJECT TO THE ACCEPTANCE OF THE ARCHITECT AND WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF ALL TRADES OR FOR THE PROPER EXECUTION OF THE WORK.

- A Plumbing Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Coordinate with the Architectural Drawings and details for exact location of ductwork, piping and equipment.
- B The Contractor shall follow Drawings in layout work and shall coordinate all trades to verify spaces in which work shall be installed. Maintain maximum headroom or space conditions. Where space conditions appear inadequate, the Architect shall be notified before installation. Do not proceed with the installation until receiving clarifying instructions.
- C Refer to Division 01 Specifications for additional requirements.

3.03 PAINTING

- A General:
 - 1. Provide labor, materials, and equipment necessary for filed prime painting. Protect flooring and equipment with drop cloths and store paint and materials in a location where directed. Wire brush and remove all oil, dirt, rust and grease before applying paint.

2. Paint all exposed, uninsulated, non-galvanized sheet metal, other than stainless steel and aluminum, with two coats of aluminum paint or alkyd paint of a color as directed.
 3. Paint all exposed, uninsulated, galvanized, aluminum and stainless steel sheet metal in finished spaces, including mechanical equipment rooms, with one coat of galvanized iron primers and two coats of alkyd oil paint.
 4. Paint insulated piping and equipment covering with one coat of primer sealer and two coats of alkyd oil paint of a color as directed.
 5. Factory or field apply one coat of heat resisting paint for steel pipe and finned tube radiation.
 6. Paint exposed steel and metal work not furnished with factory-painted finish, structural steel piping support and uninsulated piping with two coats of alkyd oil paint of a color as directed.
 7. Apply zinc chromate primer for black steel piping, cast iron piping (except underground), steel and iron work and steel tanks before insulation.
 8. Dip in zinc chromate primer, uncoated hangers, supports, rods and inserts.
- B Refer to Division 09 Specifications for paint requirements.
- C Finish painting:
1. Provide finish painting for piping continuously painted in all exposed areas consisting of two finished coats of high gloss medium or long alkyd paint over prime coat of a color shade as accepted after submittal.
 2. Utilize color as follows on Sherwin Williams, "Kem Lustral" or "Metalastic II" name and figure numbers.
 - a. Refrigeration machines and refrigerant piping — BRIGHT BLUE, F65L10.
 - b. Supply ductwork and fans — SILVER GRAY, B53A10.
 - c. Control panels — SLATE GRAY, B53A13.
 - d. Exhaust and return ductwork and fans — STEEL GRAY, B53A11.
 - e. Fire detection and alarm conduit, fire stand pipe, sprinkler piping — VERMILLION, F65R1.
 - f. Compressed air piping and equipment — LIGHT GRAY, F65A2.
 - g. Vent and relief piping — RICH BROWN, F65N11.
 - h. City water — LIGHT GREEN, F65G39.
 3. Place unlisted piping, ductwork or equipment in one of the following classifications and color coded shades as accepted. This corresponds to colors of ANSI A13.1, (Scheme for identification of piping systems).
 - a. Red for fire-protection materials.
 - b. Yellow or Orange for dangerous materials.

- c. Green or blue for safe materials.
 - d. Dark Blue or Purple for extra valuable materials.
 - e. Gray for general equipment.
- 4. Shades shall be consistent throughout the project.
- 5. Coat valve, strainer or other appurtenances operating at over 220 F where bare metal is exposed with Silicone Alkyd Aluminum, 71S30.
- D Apply factory prime coat for pumps, fans, motors, equipment, registers, diffusers, and grilles.
- E Apply on machinery, one shop coat of metal primer and two finish coats of gray engine enamel.
- F Apply on control valve handles, one coat of lead and oil paint of color as selected.
- G Paint fire dampers with prime coat and second coat of corrosion inhibitive paint.
- H Spot prime coat marred surface of prime coated equipment and piping to match adjacent coat.

3.04 PIPING IDENTIFICATION

- A Stenciling:
 - 1. Mark piping every 10 ft with size, purpose, and direction of flow and clearly stencil letters and flow arrows with flat black paint, block type letters and white background.
 - 2. Indicate systems, size and direction of flow piping to be stenciled by Painting Contractor. Supervise stenciling and make stenciling readable from the floor of point from which ordinarily read.
 - 3. Perform stenciling in accordance with the latest edition ANSI A13.1.
- B Pipe markers:
 - 1. Provide factory fabricated, snap-on type pipe markers with service legend and flow arrows. The pipe markers shall be the weatherproof plastic type and shall not be used where surface temperature exceeds 180 degrees.
 - 2. The pipe marker shall be similar to Seton Name Plate Corporation "Setmark," with the following types:
 - a. Smaller than 6 in.: Setmark SNA, completely encircling pipe.
 - b. 6 in and larger: Setmark STR, stainless steel spring fasteners.

3. Adhesive type markers will not be permitted.

3.05 WATERPROOFING

- A Refer to Division 07 Specifications for requirements.
- B Where any work pierces waterproofing, installation shall be subject to review, provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.

3.06 FIELD QUALITY CONTROL

- A Perform tests as noted, and in the presence of Architect and/or Engineer and authorities having jurisdiction.
- B Provide required labor, material, equipment, and connections necessary for tests and submit results for review.
- C Repair or replace defective work and pay for restoring or replacing damaged work due to tests, as directed. Refer to Division 01 Specifications for additional requirements.
- D Tests and instruction: Refer to other sections for additional requirements requirements.
 1. Perform the following tests and inspections:
 - a. Portions of testing and inspecting requirements in this article are taken from model plumbing codes. Verify requirements are applicable to location of this Project.
 2. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 3. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- 4. See Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.
 - 5. Domestic water piping will be considered defective if it does not pass tests and inspections.
 - 6. Prepare test and inspection reports.

3.07 CLEANING

- A Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.
- B Clean and repair painted exposed work, soiled or damaged, to match adjoining work before final acceptance.
- C Remove debris from inside and outside of material and equipment.

END OF SECTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Pipe sleeves.
- B Manufactured sleeve-seal systems.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 220523 - General-Duty Valves for Plumbing Piping.
- C Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D Section 220719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc coated or cast iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D Clearances:
 - 1. Provide allowance for insulated piping.

2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

A Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 PREPARATION

- A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B Install piping to conserve building space, to not interfere with use of space and other work.
- C Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D Structural Considerations:
 1. Do not penetrate building structural members unless indicated.

- E Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 - 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 - 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
- F Manufactured Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a water-tight seal.
 - 6. Install in accordance with manufacturer's recommendations.
- G When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

- A Upon completion of work, clean all parts of the installation.
- B Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Applications.
- B General requirements.
- C Angle valves.
- D Ball valves.
- E Check valves.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 083100 - Access Doors and Panels.
- C Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- D Section 220553 - Identification for Plumbing Piping and Equipment.
- E Section 220719 - Plumbing Piping Insulation.
- F Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2026.
- C ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.
- D ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

- F ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).
- G MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- H MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.

3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
 5. Secure check valves in either the closed position or open position.
- B Use the following precautions during storage:
1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A See drawings for specific valve locations.
- B Provide the following valves for the applications if not indicated on drawings:
1. Shutoff: Ball .
- C Domestic, Hot and Cold Water Valves:
1. 2 NPS (50 DN) and Smaller:
 - a. Bronze: Provide with solder-joint ends.
 - b. Bronze Angle: Class 125, bronze disc.
 - c. Ball: Two piece, full port, bronze with bronze trim.
 - d. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

- A Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B Valve Sizes: Match upstream piping unless otherwise indicated.
- C Valve Actuator Types:
- D Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.
2. Solder Joint Connections: ASME B16.18.

E General ASME Compliance:

1. Solder-joint Connections: ASME B16.18.

2.03 BRONZE ANGLE VALVES

A Class 125: CWP Rating: 200 psig (1380 kPa) and 350 degrees F..

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Ends: Threaded.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04 BRONZE BALL VALVES

A Two Piece, Full Port with Bronze Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 600 psig (4140 kPa).
4. Body: Bronze.
5. Ends: Threaded.
6. Seats: PTFE.

2.05 STAINLESS STEEL BALL VALVES

A Three Piece, Full Port with Stainless Steel Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 1000 psig (6895 kPa).
4. Body: Stainless steel.
5. Seats: PTFE.
6. Stem: Stainless steel.
7. Ball: Stainless steel.
8. Bolts: Stainless steel.

2.06 BRONZE SWING CHECK VALVES

- A Class 125: CWP Rating: 200 psig (1380 kPa) and _____.
1. Comply with MSS SP-80, Type 3.
 2. Design: Horizontal flow.
 3. Body: Bronze, ASTM B62.
 4. Ends: Threaded as indicated.
 5. Disc: Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

- A Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B Verify valve parts to be fully operational in all positions from closed to fully open.
- C Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- D Install check valves where necessary to maintain direction of flow as follows:
 - 1. Lift Check: Install with stem plumb and vertical.
 - 2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Support and attachment components for equipment, piping, and other plumbing work.

1.02 RELATED REQUIREMENTS

- A Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- B Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

- A ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2025.
- D ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- E ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- G MFMA-4 - Metal Framing Standards Publication; 2004.
- H MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

- I UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
 - 1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- D Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A Comply with applicable building code.
- B Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B Materials for Metal Fabricated Supports: Comply with Section 055000.
- C Metal Channel (Strut) Framing Systems:
1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 2. Comply with MFMA-4.
 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
- D Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
- E Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
 - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
 - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
 - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
 2. PVC Jacket:

- a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - c. Thickness: 60 mil (1.524 mm).
 3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
- F Pipe Supports:
1. Liquid Temperatures Up To 122 degrees F (50 degrees C):
 - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
 - b. Support From Below: MSS SP-58 Types 35 through 38.
- G Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
 2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- H Riser Clamps:
1. Provide copper plated clamps for copper tubing support.
 2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- I Pipe Hangers: For a given pipe run use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
 2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- J Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Hollow Masonry: Use toggle bolts.
 3. Hollow Stud Walls: Use toggle bolts.
 4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 5. Sheet Metal: Use sheet metal screws.

6. Wood: Use wood screws.
 7. Plastic and lead anchors are not permitted.
- K Pipe Installation Accessories:
1. Inserts and Clamps:

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that mounting surfaces are ready to receive support and attachment components.
- C Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

- 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H Secure fasteners according to manufacturer's recommended torque settings.
- I Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect support and attachment components for damage and defects.
- C Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Tags.
- B Pipe markers.
- C Ceiling tacks.

1.02 REFERENCE STANDARDS

- A ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.03 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C Product Data: Provide manufacturers catalog literature for each product required.
- D Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A Piping: Pipe markers.
- B Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 TAGS

- A Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

- B Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.03 PIPE MARKERS

- A Comply with ASME A13.1.
- B Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- C Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

2.04 CEILING TACKS

- A Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- B Color code as follows:
 - 1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

- A Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A Install tags with corrosion resistant chain.
- B Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag chart and schedule.
- D Locate ceiling tacks to locate valves above lay-in panel ceilings.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Piping insulation.
- B Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- D ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- E ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- F ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2026.
- G ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- H ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- I ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- J ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

- K ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- M UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

- A Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A Maintain ambient conditions required by manufacturers of each product.
- B Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).

3. Maximum Moisture Absorption: 0.2 percent by volume.
- B Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
 - C Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
 - D Vapor Barrier Lap Adhesive: Compatible with insulation.
 - E Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 - F Indoor Vapor Barrier Finish:
 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
 - G Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
 - H Insulating Cement: ASTM C449.

2.03 CELLULAR GLASS

- A Insulation: ASTM C552, Type II, Grade 6.
 1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
 2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
 3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m) maximum per inch.
 4. Water Absorption: 0.5 percent by volume, maximum.

2.04 POLYETHYLENE

- A Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
 1. K (Ksi) Value: ASTM C177; 0.25 at 75 degrees F (0.036 at 24 degrees C).
 2. Maximum Service Temperature: 200 degrees F (93 degrees C).

3. Density: 2 lb/cu ft (32 kg/cu m).
4. Maximum Moisture Absorption: 1.0 percent by volume.
5. Moisture Vapor Permeability: 0.05 perm inch (0.073 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.05 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

B Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.06 JACKETS

A PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
2. Covering Adhesive Mastic: Compatible with insulation.

B Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

1. Thickness: 0.016 inch (0.40 mm) sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that piping has been tested before applying insulation materials.
- B Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C Exposed Piping: Locate insulation and cover seams in least visible locations.
- D Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I Inserts and Shields:

1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

K Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

L Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

M Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

N Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A Plumbing Systems:

1. Refer to piping schedules on drawings for insulation types, thickness and other requirements.

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B Sanitary waste piping, above grade.
- C Domestic water piping, buried within 5 feet (1500 mm) of building.
- D Domestic water piping, above grade.
- E Storm drainage piping, buried within 5 feet (1500 mm) of building.
- 1. Pipe flanges, unions, and couplings.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 083100 - Access Doors and Panels.
- C Section 099113 - Exterior Painting.
- D Section 099123 - Interior Painting.
- E Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- F Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- G Section 220553 - Identification for Plumbing Piping and Equipment.
- H Section 220719 - Plumbing Piping Insulation.
- I Section 312316 - Excavation.
- J Section 312316.13 - Trenching.
- K Section 312323 - Fill.
- L Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

- A ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2025).
- B ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D ASME B31.9 - Building Services Piping; 2025.
- E ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2025, with Errata.
- F ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025, with Errata.
- G ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
- H ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2026.
- I ASTM B32 - Standard Specification for Solder Metal; 2020.
- J ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2025.
- K ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- L ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- M ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- N ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- O ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- P ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2026.
- Q ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- R ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2025a.

- S ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).
- T ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.
- U ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2024.
- V ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- W ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).
- X ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.
- Y ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014 (Reapproved 2021).
- Z ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022 (Reapproved 2026).
- AA ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2021.
- BB ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
- CC ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2026.
- DD ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.
- EE ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2026.
- FF ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.
- GG AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.
- HH AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

- II AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
- JJ AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2024.
- KK AWWA C651 - Disinfecting Water Mains; 2023.
- LL AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.
- MM CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- NN CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- OO MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- PP NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- QQ NSF 372 - Drinking Water System Components - Lead Content; 2024.
- RR PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- D Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

- A Perform work in accordance with applicable codes.

1.06 DELIVERY, STORAGE, AND HANDLING

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Plumbing Piping

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- A Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

3. Cast Iron pipe and fittings shall be used in all plenums.

B PVC Pipe: ASTM D2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.
3. PVC piping and fittings shall be prohibited in plenums.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A Copper Pipe: ASTM B42, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

B Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.
2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch (19 mm) diameter rods.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

2.06 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.

1. Fittings: PVC.

2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

2.07 PIPE FLANGES, UNIONS, AND COUPLINGS

A Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B Flanges for Pipe Sizes Over 1 inch (25 mm, DN):

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2.08 PIPING SPECIALTIES

A Flow Controls:

1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 EXECUTION

3.01 EXAMINATION

- #### A Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- #### A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- #### B Remove scale and dirt, on inside and outside, before assembly.
- #### C Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- #### A Install in accordance with manufacturer's instructions.
- #### B Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- C Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E Group piping whenever practical at common elevations.
- F Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.
- G Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
 - 1. See Section 220719.
- H Provide access where valves and fittings are not exposed.
 - 1. Coordinate size and location of access doors with Section 083100.
- I Establish elevations of buried piping outside the building to ensure not less than 4-1/2 ft. of cover.
- J Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- K Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- L Provide support for utility meters in accordance with requirements of utility companies.
- M Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
 - 1. See Section 099123 for painting of interior plumbing systems and components.
 - 2. See Section 099113 for painting of exterior plumbing systems and components.
- N Excavate in accordance with Section 312316.13.
- O Backfill in accordance with Section 312316.13.
- P Install bell and spigot pipe with bell end upstream.
- Q Install valves with stems upright or horizontal, not inverted. See Section 220523.
- R Install water piping to ASME B31.9.

- S Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- T PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- U Sleeve pipes passing through partitions, walls, and floors.
- V Inserts:
1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm, DN).
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- W Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as indicated.
 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 8. Provide copper plated hangers and supports for copper piping.
 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

- a. Painting of interior plumbing systems and components is specified in Section 099123.
 - b. Painting of exterior plumbing systems and components is specified in Section 099113.
- 10. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 220548.
- 11. Support cast iron drainage piping at every joint.
- X When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04 APPLICATION

- A Use grooved mechanical couplings and fasteners only in accessible locations.
- B Install unions downstream of valves and at equipment or apparatus connections.
- C Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 TOLERANCES

- A Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A Disinfect water distribution system in accordance with Section 330110.58.
- B Prior to starting work, verify system is complete, flushed, and clean.
- C Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

- F Maintain disinfectant in system for 24 hours.
- G If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

- A Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
 - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
 - 2. Provide 18 gauge, 0.0478-inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.

3.08 SCHEDULES

- A Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 5/8 inch (15 mm).
 - e. Pipe Size: 8 inch (200 mm, DN) to 12 inch (300 mm, DN):

- 1) Maximum hanger spacing: 14 ft (4.25 m).
 - 2) Hanger Rod Diameter: 7/8 inch (22 mm).
- f. Pipe Size: 14 inch and Over (350 mm, DN and Over):
 - 1) Maximum Hanger Spacing: 20 ft (6 m).
 - 2) Hanger Rod Diameter: 1 inch (25 mm).
2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Drains.
- B Cleanouts.
- C Hose bibbs.
- D Backflow preventers.
- E Water hammer arrestors.
- F Mixing valves.

1.02 RELATED REQUIREMENTS

- A Section 011000 - Summary: Product requirements for Owner furnished kitchen equipment.
- B Section 221005 - Plumbing Piping.
- C Section 223000 - Plumbing Equipment.
- D Section 224000 - Plumbing Fixtures.
- E Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B ASME A112.6.3 - Floor Drains; 2022.
- C ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
- D ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- E ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

- F ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
- G ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- H NEMA MG 00001 - Motors and Generators; 2024.
- I NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- J NSF 372 - Drinking Water System Components - Lead Content; 2024.
- K PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.
- D Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Loose Keys for Outside Hose Bibbs: One.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.
- B **Refer to schedules for make and model of all plumbing fixtures/equipment and all associated accessories.**

PART 3 EXECUTION

3.01 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C Encase exterior cleanouts in concrete flush with grade.
- D Install floor cleanouts at elevation to accommodate finished floor.
- E Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F Pipe relief from backflow preventer to nearest drain.
- G Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.
- H Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION

SECTION 223000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Water Heaters:
 - 1. Commercial electric.
- B Diaphragm-type compression tanks.

1.02 RELATED REQUIREMENTS

- A Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .
- B NEMA MG 00001 - Motors and Generators; 2024.
- C NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.
- E UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittals procedures.
- B Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Provide electrical characteristics and connection requirements.

C Shop Drawings:

1. Indicate heat exchanger dimensions, size of tappings, and performance data.
2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D Project Record Documents: Record actual locations of components.

E Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

F Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B Certifications:

1. Water Heaters: NSF approved.
2. Electric Water Heaters: UL listed and labeled to UL 174.
3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

D Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 DELIVERY, STORAGE, AND HANDLING

A Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

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- A See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

REFER TO SCHEDULES FOR MAKE AND MODEL OF ALL PLUMBING FIXTURES/EQUIPMENT AND ALL ASSOCIATED ACCESSORIES.

PART 3 EXECUTION

4.01 INSTALLATION

- A Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Water closets.
- B Lavatories.
- C Mop sinks.
- D Under-lavatory pipe supply covers.

1.02 RELATED REQUIREMENTS

- A Section 064100 - Architectural Wood Casework: Preparation of counters for sinks and lavatories.
- B Section 079200 - Joint Sealants: Sealing joints between fixtures and walls and floors.
- C Section 123600 - Countertops: Preparation of counters for sinks and lavatories.
- D Section 221005 - Plumbing Piping.
- E Section 221006 - Plumbing Piping Specialties.
- F Section 223000 - Plumbing Equipment.
- G Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- C ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- D ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- E ASME A112.18.1 - Plumbing Supply Fittings; 2024.

- F ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).
- G ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.
- H ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- I ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.
- J ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- K ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- L ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.
- M FM (AG) - FM Approval Guide; Current Edition.
- N ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- O NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- P NSF 372 - Drinking Water System Components - Lead Content; 2024.
- Q UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C Manufacturer's Instructions: Indicate installation methods and procedures.
- D Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DESCRIPTION OF WORK

- A Provide all plumbing fixtures, fittings, trim, and accessories shown on the drawings, as required by the State and local codes, the Authority Having Jurisdiction, and as specified herein.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Accept fixtures on site in factory packaging. Inspect for damage.
- B Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B **Refer to schedules for make and model of all plumbing fixtures and all associated accessories.**

2.02 REGULATORY REQUIREMENTS

- A Comply with applicable codes for installation of plumbing systems.
- B Comply with UL (DIR) requirements.
- C Perform work in accordance with local health department regulations.
- D Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B Verify that electric power is available and of the correct characteristics.
- C Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A Install each fixture with trap, easily removable for servicing and cleaning.
- B Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C Install components level and plumb.
- D Install and secure fixtures in place with wall supports and bolts.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A Clean plumbing fixtures and equipment.
- B See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

- A Protect installed products from damage due to subsequent construction operations.
- B Do not permit use of fixtures by construction personnel.
- C Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 230001 - GENERAL PROVISION FOR HVAC WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A Drawings and general provisions of Contract, including General Conditions, and Division 01 Specification Sections apply to work of this Section.

1.02 WORK INCLUDED

- A Work in this Section includes the providing of labor, materials, equipment and services necessary for a complete and safe installation in accordance with the contract documents and all applicable codes and authorities having jurisdiction for the following:
 - 1. PIPING.
 - 2. VRF/FAN COIL SYSTEMS.
 - 3. AIR COOLED CONDENSER SYSTEM (FOR SPLIT DX SYSTEM).
 - 4. SHEET METAL WORK.
 - 5. AIR HANDLING SYSTEM EQUIPMENT.
 - 6. AIR DISTRIBUTION SYSTEM EQUIPMENT.
 - 7. HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.
 - 8. INSULATION.
 - 9. MOTORS.
 - 10. MOTOR CONTROLLERS.
 - 11. AUTOMATIC CONTROL SYSTEM.
 - 12. VIBRATION ISOLATION.
 - 13. NOISE CONTROL.
 - 14. BALANCING AIR AND WATER SYSTEMS.
 - 15. Provide drainage from noted equipment to floor drains, roof, sink, or funnel drains.

1.03 PERMITS AND REGULATIONS

- A Mechanical contractor and plumbing contractor shall obtain, fill-out, sign and seal permit application and will submit and pay permit costs. Contractor shall prepare specific plans as required by proper Authorities before their acceptance of the work. Each Contractor will be responsible and pay for his own fire permits, open flame permits, etc. required by Local and State Fire Regulations governing use of burning tools, etc. Contractor shall cooperate with local enforcement agency in all required or requested inspections, and will notify the Architect/Engineer of inspection schedules.
- B All work, materials, equipment and workmanship shall comply with all pertinent State, County and Municipal Laws and the requirements of such regulatory bodies as:
 - 1. International Mechanical Code
 - 2. International Fuel Gas Code
 - 3. International Plumbing Code
 - 4. National Sanitation Foundation
 - 5. International Building Code
 - 6. National Electric Code
 - 7. International Energy Conservation Code
 - 8. ASHRAE 90.1
 - 9. ANSI A117.1 Barrier Free Subcode
 - 10. National Fire Protection Association (NFPA)
 - 11. Air Conditioning and Refrigeration Institute (ARI)
 - 12. Air Diffusion Council (ADC)
 - 13. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 14. Associated Air Balance Council (AABC)
 - 15. American Society of Mechanical Engineers (ASME)
 - 16. American Society for Testing and Materials (ASTM)
 - 17. National Electric Manufacturers Association (NEMA)

18. Underwriters Laboratories (UL)

1.04 CODES AND STANDARDS

- A Codes and Standards listed, insofar as they apply, form a part of these Specifications, the same as if they were fully written and shall be followed as minimum requirements. Where standards conflict, that standard with the more stringent requirements shall be applicable. This shall not be construed as relieving the Contractor from providing the highest grade of material and workmanship specified.
- B The Contractor shall give written notice to the Architect of any materials or apparatus believed in violation of laws, ordinances, rules or regulations, or Authorities Having Jurisdiction.
- C All equipment shall comply with all applicable requirements of laws, codes, ordinances, legislation, etc., of all Federal, State, and Local Authorities, whether or not indicated on the Contract Documents.
- D The referenced codes shall include any and all supplements, addenda, memoranda, information bulletins and any other changes and additions effective prior to the Date of Substantial Completion by adoption of the local Authority Having Jurisdiction.
- E Modifications required by the Authorities Having Jurisdiction shall be made without additional charge to the Owner.
- F Where alterations to and/or deviations from the Contract Documents are required by the Authorities, report the requirements to the Architect and secure his approval before starting the alterations.
- G Where Contract Documents' requirements are in excess of Code requirements and are permitted under the Code, the Contract Documents shall govern.
- H All rules and regulations of the Underwriters Laboratories shall be complied with whether or not indicated in the Contract Documents. Provide Division 23 equipment having UL labels or labeled by an independent testing agency acceptable to the Authority Having Jurisdiction.

1.05 DESCRIPTION OF BID DOCUMENTS

- A Specifications, in general, describe quality and character of materials and equipment.
- B Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and methods of installation. Provide additional offsets, fittings, hangers, supports, valves, drains as required for construction and coordination with work of other trades.

- C Scaled and indicated dimensions are approximate and are for estimating purposes only. Before proceeding with work, check and verify all dimensions.
- D Where variances occur between the Drawings and the Specifications or within either document itself, the items or arrangement of better quality, greater quantity, or higher cost shall be included in the contract price. The Contractor shall request clarification in writing from the Architect on which item and manner in which the work shall be installed.
- E Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
- F Typical details, where shown on the drawings, apply to each and every item of the project where such items are applicable. Typical details are not repeated in full on the plans, and are diagrammatic only, but with the intention that such details shall be incorporated in full.
- G If any part of Specifications or Drawings appears unclear or contradictory, consult Architect and Engineer for interpretation and decision as early as possible during bidding period. Do not proceed with work without the Architect's and/or Engineer's decision. If no consultation with Architect and/or Engineers has taken place, prior to bid submissions, contractor shall bid project to include the most expensive and/or stringent of the solutions.

1.06 DEFINITIONS

- A "Provide": to supply, install and make complete, safe, and operable, the particular work referred to unless specifically indicated otherwise.
- B "Install": to erect, mount and make complete with all related accessories.
- C "Furnish" or "supply": to purchase, procure, acquire, and deliver complete with related accessories.
- D "Work": includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.
- E "Piping": includes pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and all related accessories.
- F "Wiring": includes raceway, fittings, wire, boxes, and all related accessories.
- G "Concealed": not in view, installed in masonry or other construction, within furred spaces, double partitions, hung ceilings, trenches, crawl spaces, or enclosures.
- H "Exposed": in view, not installed underground or "concealed" as defined above.

- I "Indicated," "shown," or "noted": as indicated, shown or noted on drawings or specifications.
- J "Reviewed," "satisfactory," "accepted," or "directed": as reviewed, satisfactory, accepted, or directed by or to Architect and/or Engineer.
- K "Motor Controllers": includes manual or magnetic starters with or without switches, individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- L "Control or Actuating Devices": includes automatic sensing and switching devices such as thermostats, pressure, float, flow, electro-pneumatic switches and electrodes controlling operation of equipment.

1.07 QUALITY ASSURANCE

- A All equipment and accessories shall be the product of manufacturers regularly engaged in their manufacture. All items of a given type shall be the products of the same manufacturer.
- B Furnish all equipment and accessories new and free from defects.
- C All electrical equipment shall be listed by Underwriters' Laboratories, Inc. (UL) or bear UL labels.
- D Supply all equipment and accessories in complete compliance with and in accordance with the applicable standards listed in reference standards of this Section and will all applicable national, state and local codes.

1.08 JOB CONDITIONS

- A Inspection of Site Conditions:
 - 1. Before starting work, visit the site and examine the conditions under which the work has to be performed. Report in writing, to Architect/Engineer, any conditions which might adversely affect the work.

1.09 REFERENCE STANDARDS

- A Published specifications, standards tests, or recommended methods of trade, industry or governmental organizations apply to work in all Sections as noted below:
 - 1. ASHRAE - American Society of heating, Refrigerating and Air Conditioning engineers.

2. AABC - Associated Air Balance Controls.
3. AMCA - Air Moving and Conditioning Association.
4. ADC - Air Diffuser Council.
5. NEMA - National Electrical Manufacturers' Association.
6. ANSI - American National Standards Institute.
7. ASME - American Society of Mechanical Engineers.
8. ASTM - American Society for Testing and Materials.
9. NFPA - National Fire Protection Association.
10. ARI - Air-Conditioning and Refrigeration Institute.
11. UL - Underwriters' Laboratories, Inc.
12. OSHA - Occupational Safety and Health Administration Regulations.

1.10 SUBMITTALS

- A Submit shop drawings product data, samples and certificates of compliance required by contract documents, "AIA Document 201" and "SUPPLEMENTARY CONDITIONS FOR MECHANICAL AND ELECTRICAL WORK." Refer to Division 01 Specifications for additional requirements.
- B Operating instructions, maintenance manuals and parts lists.
 1. Provide five sets of manufacturer's equipment brochures and service manuals consisting of the following:
 - a. Descriptive literature for equipment and components.
 - b. Model number and performance data.
 - c. Installation and operating instructions.
 - d. Maintenance and repair instructions.
 - e. Recommended spare parts lists.
 2. Assemble manufacturers' equipment manuals in chronological order following the specifications' numbering system using heavy duty three ring binders.
 3. Submit valve tag chart.
 4. Submit three sets of field test reports including instrument set points and normal operating valves.
 5. Refer to Division 01 Specification for additional requirements.

1.11 COORDINATED COMPOSITE DRAWINGS

- A The Contractor shall prepare full coordinated composite drawings for the mechanical, electrical, plumbing and fire protection trades. The Contractor shall overlay each trade's work (in separate colors) on a set of sheetmetal drawings. All conflicts and potential conflicts shall be clearly identified on the sheetmetal drawings. This shall include but not be limited to conflicts with lights, equipment, piping, ductwork and supports of other trades, as well as conflicts with architectural and structural walls, columns, ceilings and structural beams. All trades shall resolve conflicts and sign off each sheetmetal drawing indicating acceptance and satisfactory resolution to all conflicts. All conflicts that cannot be resolved shall be brought to the attention of the Architect and Engineer.

1.12 RECORD DRAWINGS

- A The contractor shall maintain a complete set of "Record Drawings" reflecting an accurate dimensional record of all work. Refer to Division 01 Specifications for additional requirements.

1.13 CLEARANCE FROM ELECTRICAL EQUIPMENT

- A Piping and ductwork is prohibited in electric and telephone rooms and closets, elevator machine rooms, and for installations over or within 5 ft of transformers, substations, switchboards, motor control centers, standby power plants, and motors.
- B Branch piping to equipment is acceptable when installed over or within 5 ft of motors.

1.14 DRIP PANS

- A Provide drip pans under piping when installation over or within 5 ft of electrical apparatus is unavoidable or in rooms containing electrical equipment. Pan shall be reinforced, properly supported and made watertight. Provide enclosed type for pressure piping. Extend 1-1/4 in. drain pipe from pan to spill over nearest floor drain or as indicated.
 - 1. Construction shall be 32 oz sheet copper.
 - 2. Construction shall be 18 gauge galvanized sheet steel.

1.15 PRODUCT, DELIVERY, HANDLING AND STORAGE

- A Ship materials and equipment in crated sections of sizes to permit passing through available space, where required.

- B Receive and accept materials and equipment at the site, properly handle, house, and protect them from damage and the weather until installation. Replace equipment damaged in the course of handling without additional charge.
- C Arrange for and provide storage space or area at the job site for all materials and equipment to be received and/or installed in this project.

1.16 TEMPORARY HEAT

- A Temporary heat will be provided under General Construction Work.

1.17 ACCESSIBILITY

- A Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made without written approval.
- B Group concealed valves, expansion joints, controls, dampers, and equipment requiring access, so as to be freely accessible through access doors.

1.18 SPECIAL TOOLS

- A Provide one set of any special tools required to operate, adjust, dismantle or repair equipment furnished under this Division for the Owner's use at the completion of the work.
- B Provide one pressure grease gun with adapters for each type of grease required.
- C Provide one suitable tool case for special tools.

1.19 CUTTING AND PATCHING

- A Refer to Division 01 Specifications for requirements.

1.20 UTILITY CONNECTIONS

- A Arrange for and pay costs for all specified utilities including the following:
 - 1. Connection to utility company mains.
 - 2. Payment of service charges.
 - 3. Provision for temporary utilities.

4. Connect in accordance with authority having jurisdiction.

1.21 PROTECTION OF MATERIALS

- A Protect from damage, water, dust, etc., materials, equipment and apparatus provided under this trade, both in storage and installed.

PART 1 – PRODUCTS

2.01 BASE BID MANUFACTURERS

- A Base bid on materials or equipment are specified by name of manufacturer, brand or trade name and catalog reference.
- B Refer to Division 01 Specifications for substitutions.
- C The following are base bid manufacturers for items under this Section:
 1. Inserts: F and S Mfg Co., Fee and Mason and Grinnell.
 2. Hangers and supports: I.T.T. Grinnell, Carpenter and Patterson, Inc., and Fee & Mason.

2.02 INSERTS AND SUPPORTS

- A Support all HVAC work from building construction by providing inserts, beam clamps, steel fishplates (in concrete fill only), and acceptable brackets. Submit all methods for review.
- B Provide trapeze hangers of bolted angles or channels for grouped lines and services.
- C Provide additional framing where building construction is inadequate. Submit for review.
- D Inserts shall be steel, slotted type and factory-painted.
 1. Single rod shall be similar to Grinnell Fig. 281.
 2. Multi-rod shall be similar to Fee & Mason Series 9000 with end caps and closure strips.
 3. Clip form nails flush with inserts.
 4. Maximum loading including pipe, contents and covering shall not exceed 75 percent of rated insert capability.

- E Supports from steel decks:
 - 1. Pipes:
 - a. Maximum size: 2-inch diameter.
 - b. Hanger spacing: maximum 10-feet centers.
 - 2. Ductwork:
 - a. Hangers spacing: maximum 16-feet centers.

2.03 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS:

- A Furnish supplementary steel, channels and supports required for proper installation, mounting and support of HVAC work.
- B Connect supplementary steel and channels firmly to building construction in an acceptable manner.
- C Determine type and size of supporting channels and supplementary steel.
Supplementary steel and channels shall be of sufficient strength and size to allow only a minimum deflection in conformance with manufacturer's requirements of loading.
- D Install supplementary steel and channels in a neat and workmanlike manner parallel to walls, floors, and ceiling construction.
- E All supplementary steel, channels, supports shall be submitted to Structural Engineer for review.

2.04 EXPANSION ANCHORS

- A Provide smooth wall, non-self-drilling internal plug expansion type anchors constructed of AISC 12L14 steel and zinc plated in accordance with Fed. Spec. QQ-A-325 Type 1, Class 3.
- B Do not exceed 1/4 of average valves for a specific anchor size using 2000 psig concrete only, for maximum working load.
- C Provide spacing and install anchors in accordance with manufacturer's recommendations.

2.05 ACCESS DOORS

- A Refer to Division 08 Specifications for requirements.

2.06 ACCESS TILE IDENTIFICATION:

- A In removable ceiling tiles, provide buttons, tabs, and markers to identify location of concealed work. Submit for review.

2.07 NAMEPLATES

- A Provide nameplates with inscriptions, subject to review, indicating equipment and voltage. Fasten with epoxy cement or chrome plated screws. Nameplate shall be black Lamicoid sheet with white lettering.
- B Provide nameplates for gauges, meters, instruments, control devices, pilot lamps, transmitters, motor controllers and panel mounted equipment.

PART 1 - EXECUTION

3.01 COORDINATION

- A The Contractor shall assure full cooperation of all trades and shall furnish in writing all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B Prepare coordinated composite drawings at a suitable scale not less than 1/4-inch equals one foot, zero inches, clearly showing how the work of this Division is to be installed in relation to the work of all trades. Any work installed in conflict with the work of other trades shall be corrected at no additional cost to the Owner.
- C The Contractor may, subject to the acceptance of the Architect and without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of all trades or for the proper execution of the work.
- D Mechanical Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Coordinate with the Architectural Drawings and details for exact location of ductwork, piping and equipment.
- E The Contractor shall follow Drawings in layout work and shall coordinate all trades to verify spaces in which work shall be installed. Maintain maximum headroom or space conditions. Where space conditions appear inadequate, the Architect shall be notified before installation. Do not proceed with the installation until receiving clarifying instructions.
- F Refer to Division 01 Specifications for additional requirements.

3.02 PAINTING

- A General:

1. Provide labor, materials, and equipment necessary for field prime painting. Protect flooring and equipment with drop cloths and store paint and materials in a location where directed. Wire brush and remove all oil, dirt, rust and grease before applying paint.
 2. Paint all exposed, uninsulated, non-galvanized sheet metal, other than stainless steel and aluminum, with two coats of aluminum paint or alkyd paint of a color as directed.
 3. Paint all exposed, uninsulated, galvanized, aluminum and stainless steel sheet metal in finished spaces, including mechanical equipment rooms, with one coat of galvanized iron primers and two coats of alkyd oil paint.
 4. Paint insulated piping and equipment covering with one coat of primer sealer and two coats of alkyd oil paint of a color as directed.
 5. Factory or field apply one coat of heat resisting paint for steel pipe and finned tube radiation.
 6. Paint exposed steel and metal work not furnished with factory-painted finish, structural steel piping support and uninsulated piping with two coats of alkyd oil paint of a color as directed.
 7. Apply zinc chromate primer for black steel piping, cast iron piping (except underground), steel and iron work and steel tanks before insulation.
 8. Dip in zinc chromate primer, uncoated hangers, supports, rods and inserts.
- B Refer to Division 09 Specifications for paint requirements.
- C Finish painting:
1. Provide finish painting for piping continuously painted in all exposed areas consisting of two finished coats of high gloss medium or long alkyd paint over prime coat of a color shade as accepted after submittal.
 2. Utilize color as follows on Sherwin Williams, "Kem Lustral" or "Metalastic II" name and figure numbers.
 - a. Refrigeration machines and refrigerant piping — BRIGHT BLUE, F65L10.
 - b. Supply ductwork and fans — SILVER GRAY, B53A10.
 - c. Control panels — SLATE GRAY, B53A13.
 - d. Exhaust and return ductwork and fans — STEEL GRAY, B53A11.
 - e. Fire detection and alarm conduit, fire stand pipe, sprinkler piping — VERMILLION, F65R1.
 - f. Compressed air piping and equipment — LIGHT GRAY, F65A2.
 - g. Vent and relief piping — RICH BROWN, F65N11.
 - h. City water — LIGHT GREEN, F65G39.

3. Place unlisted piping, ductwork or equipment in one of the following classifications and color coded shades as accepted. This corresponds to colors of ANSI A13.1, (Scheme for identification of piping systems).
 - a. Red for fire-protection materials.
 - b. Yellow or Orange for dangerous materials.
 - c. Green or blue for safe materials.
 - d. Dark Blue or Purple for extra valuable materials.
 - e. Gray for general equipment.
 4. Shades shall be consistent throughout the project.
 5. Coat valve, strainer or other appurtenances operating at over 220 o F where bare metal is exposed with Silicone Alkyd Aluminum, 71S30.
- D Paint interior of ductwork as far back as visible from outside, flat black.
- E Apply factory prime coat for pumps, fans, motors, equipment, registers, diffusers, and grilles.
- F Apply on machinery, one shop coat of metal primer and two finish coats of gray engine enamel.
- G Apply on control valve handles, one coat of lead and oil paint of color as selected.
- H Paint fire dampers with prime coat and second coat of corrosion inhibitive paint.
- I Spot prime coat marred surface of prime coated equipment and piping to match adjacent coat.

3.03 PIPING IDENTIFICATION

- A Stenciling:
1. Mark piping every 10 ft with size, purpose, and direction of flow and clearly stencil letters and flow arrows with flat black paint, block type letters and white background.
 - a.

<u>Outside Dia. of Pipe Covering</u>	<u>Size of Stencil</u>
3/4 in. - 1-1/4 in.	3/4 in. - 1-1/4 in.
1/2 in. 1-1/2 in. - 2 in.	3/4 in. 2-1/2 in. -
6 in.	1-1/4 in. 8 in. - 10 in.
2-1/2 in.	
over 10 in.	3-1/2 in.
 2. Indicate systems, size and direction of flow piping to be stenciled by Painting Contractor. Supervise stenciling and make stenciling readable from the floor of point from which ordinarily read.
 3. Perform stenciling in accordance with the latest edition ANSI A13.1.

B Pipe markers:

1. Provide factory fabricated, snap-on type pipe markers with service legend and flow arrows. The pipe markers shall be the weatherproof plastic type and shall not be used where surface temperature exceeds 180 degrees.
2. The pipe marker shall be similar to Seton Name Plate Corporation "Setmark," with the following types:
 - a. Smaller than 6 in.: Setmark SNA, completely encircling pipe.
 - b. and larger: Setmark STR, stainless steel spring fasteners.
3. Adhesive type markers will not be permitted.

3.04 WATERPROOFING

- A Refer to Division 07 Specifications for requirements.
- B Where any work pierces waterproofing, installation shall be subject to review, provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.

3.05 FIELD QUALITY CONTROL

- A Perform tests as noted, and in the presence of Architect and/or Engineer and authorities having jurisdiction.
- B Provide required labor, material, equipment, and connections necessary for tests and submit results for review.
- C Repair or replace defective work and pay for restoring or replacing damaged work due to tests, as directed. Refer to Division 01 Specifications for additional requirements.
- D Tests and instruction: Refer to other Division 23 Specifications for requirements.

3.06 CLEANING

- A Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.
- B Clean and repair painted exposed work, soiled or damaged, to match adjoining work before final acceptance.
- C Remove debris from inside and outside of material and equipment.

END OF SECTION

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Pipe sleeves.
- B Manufactured sleeve-seal systems.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 230716 - HVAC Equipment Insulation.
- C Section 230719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

- A ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- B ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

- B Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
 - 2. Approved by manufacturer.
- C Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- C Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
 - 1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

E Clearances:

1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

A Manufacturers:

1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
2. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.

B Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 PREPARATION

- A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

- A Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B Install piping to conserve building space, to not interfere with use of space and other work.
- C Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 m).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E Structural Considerations:
 - 1. Do not penetrate building structural members unless indicated.
- F Provide sleeves when penetrating floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 - 2. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
 - 3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
 - 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 3. Locate piping in center of sleeve or penetration.
 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 5. Tighten bolting for a water-tight seal.
 6. Install in accordance with manufacturer's recommendations.
- H When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

- A Upon completion of work, clean all parts of the installation.
- B Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Support and attachment components for equipment, piping, and other HVAC/hydraulic work.

1.02 RELATED REQUIREMENTS

- A Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C Section 230548 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS

- A ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2025.
- D ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- E ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- F ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

- H MFMA-4 - Metal Framing Standards Publication; 2004.
- I MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- J NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

A See Section 013000 - Administrative Requirements, for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

- C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
 - 1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
- D Installer's Qualifications: Include evidence of compliance with specified requirements.
- E Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A Comply with applicable building code.
- B Installer Qualifications for Field-Welding: As specified in Section 055000.
- C Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A General Requirements:
 - 1. Comply with MSS SP-58.
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the

load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B Materials for Metal Fabricated Supports: Comply with Section 055000.

C Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.

D Fiberglass Channel (Strut) Framing Systems: Factory-fabricated continuous-slot fiberglass channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Channel Material: Use polyester resin or vinyl ester resin.
2. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.

E Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

F Steel Cable:

G Thermal Insulated Pipe Supports:

1. General Construction and Requirements:
 - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
 - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
 - d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 - c. Maximum Service Temperature: 180 degrees F (82 degrees C).
 - d. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - e. Thickness: 60 mil (1.524 mm).
 - f. Connections: Brush on welding adhesive.
3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

H Pipe Supports:

1. Liquid Temperatures Up To 122 degrees F (50 degrees C):
 - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
 - b. Support From Below: MSS SP-58 Types 35 through 38.

I Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.

1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

J Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

K Strut Clamps: Two-piece pipe clamp.

- L Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- M Pipe Hangers: For a given pipe run use hangers of the same type and material.
 - 1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
 - 2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- N Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
 - 1. Pipe Diameter 6 inches (150 mm) and Smaller: Provide minimum clearance of 0.16 inch (4 mm).
- O Pipe Alignment Guides: Galvanized steel.
 - 1. Pipe Diameter 8 inches (200 mm) and Smaller: Spider or sleeve type.
 - 2. Pipe Diameter 10 inches (250 mm) and Larger: Roller type.
- P Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- Q Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 3. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 4. Sheet Metal: Use sheet metal screws.
 - 5. Wood: Use wood screws.
 - 6. Plastic and lead anchors are not permitted.
 - 7. Powder-actuated fasteners are not permitted.
 - 8. Hammer-driven anchors and fasteners are not permitted.
- R Pipe Installation Accessories:
 - 1. Thermal Insulated Pipe Supports:

2. Overhead Pipe Supports:
3. Plenum Pipe Supports:
4. Inserts and Clamps:

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that mounting surfaces are ready to receive support and attachment components.
- C Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F Field-Welding (where approved by Architect): Comply with Section 055000.
- G Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- J Secure fasteners according to manufacturer's recommended torque settings.
- K Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect support and attachment components for damage and defects.
- C Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Nameplates.
- B Tags.
- C Stencils.
- D Pipe markers.
- E Ceiling tacks.

1.02 RELATED REQUIREMENTS

- A Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide manufacturers catalog literature for each product required.
- C Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A Air Handling Units: Nameplates.
- B Automatic Controls: Tags. Key to control schematic.
- C Control Panels: Nameplates.

- D Dampers: Ceiling tacks, where located above lay-in ceiling.
- E Ductwork: Nameplates.
- F Heat Transfer Equipment: Nameplates.
- G Major Control Components: Nameplates.
- H Small-sized Equipment: Tags.
- I Thermostats: Nameplates.

2.02 NAMEPLATES

- A Letter Color: White.
- B Letter Height: 1/4 inch (6 mm).
- C Background Color: Black.
- D Plastic: Comply with ASTM D709.

2.03 TAGS

- A Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

2.04 STENCILS

- A Stencils: With clean cut symbols and letters of following size:

2.05 PIPE MARKERS

2.06 CEILING TACKS

- A Description: Steel with 3/4 inch (20 mm) diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

- A Degrease and clean surfaces to receive adhesive for identification materials.

- B Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

- A Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Testing, adjustment, and balancing of air systems.
- B Measurement of final operating condition of HVAC systems.

1.02 RELATED REQUIREMENTS

- A Section 014000 - Quality Requirements: Employment of testing agency and payment for services.

1.03 REFERENCE STANDARDS

- A AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016 (Reaffirmed 2025).
- C ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).
- D NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).
- E SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit six weeks prior to starting the testing, adjusting, and balancing work.

2. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 3. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - f. Expected problems and solutions, etc.
 - g. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - h. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
 - i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
 - j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
 - k. Method of checking building static and exhaust fan and/or relief damper capacity.
 - l. Time schedule for deferred or seasonal TAB work, if specified.
 - m. False loading of systems to complete TAB work, if specified.
 - n. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - o. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
 - p. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D Field Logs: Submit at least twice a week to the Commissioning Authority.
- E Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- F Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Submit under provisions of Section 014000.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.
 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 6. Units of Measure: Report data in I-P (inch-pound) units only.
 7. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project altitude.
 - g. Report date.
- G Project Record Documents: Record actual locations of balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 3. SMACNA (TAB).
- B Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

- C Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- E TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.

- B Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A Hold a pre-balancing meeting _____ prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B Ensure recorded data represents actual measured or observed conditions.
- C Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

- E After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 AIR SYSTEM PROCEDURE

- A Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C Measure air quantities at air inlets and outlets.
- D Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

- L Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

3.07 SCOPE

- A Test, adjust, and balance the following:
 - 1. Air Cooled Refrigerant Condensers.
 - 2. Air Coils.
 - 3. Air Handling Units.
 - 4. Fans.
 - 5. Air Filters.
 - 6. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

- A Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
- B Air Cooled Condensers:
 - 1. Identification/number.
 - 2. Location.
 - 3. Manufacturer.
 - 4. Model number.
 - 5. Serial number.

6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

C Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Saturated suction temperature, design and actual.
11. Air pressure drop, design and actual.

D Heating Coils:

1. Location.
2. Service.
3. Manufacturer.
4. Air flow, design and actual.
5. Entering air temperature, design and actual.
6. Leaving air temperature, design and actual.
7. Air pressure drop, design and actual.

E Air Moving Equipment:

1. Location.

2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Fan RPM.

F Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

G Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Fan RPM.

H Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Duct insulation.
- B Duct liner.
- C Insulation jackets.

1.02 RELATED REQUIREMENTS

- A Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B Section 078400 - Firestopping.
- C Section 099113 - Exterior Painting: Painting insulation jackets.
- D Section 230553 - Identification for HVAC Piping and Equipment.
- E Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

- A ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- D ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2026.
- E ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- F ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2025.
- G ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

- H ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- I ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016 (Reapproved 2021).
- J ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2017 (Reapproved 2023).
- K ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- M ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- N SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- O UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B Applicator Qualifications: Company specializing in performing the type of work specified in this section, documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

- B Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A Manufacturer:
 - 1. CertainTeed Corporation
 - 2. Johns Manville
 - 3. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K (Ksi) value: 0.27 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.

2.03 GLASS FIBER, RIGID

- A Manufacturer:
 - 1. CertainTeed Corporation

2. Johns Manville
3. Knauf Insulation
4. Owens Corning Corporation
5. Substitutions: See Section 016000 - Product Requirements.

B Insulation: ASTM C612; rigid, noncombustible blanket.

1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F (232 degrees C).
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).

C Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.

D Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E Protective Coating:

F Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.

1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 180 degrees F (82 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

2.05 JACKETS

A Aluminum Jacket: ASTM B209 (ASTM B209M).

1. Thickness: 0.016 inch (0.40 mm) sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

2.06 DUCT LINER

A Manufacturers:

1. Armacell LLC
2. CertainTeed Corporation
3. Ductmate Industries, Inc, a DMI Company
4. Johns Manville
5. Knauf Insulation
6. Owens Corning Corporation
7. Substitutions: See Section 016000 - Product Requirements.

B Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.

1. Fungal Resistance: No growth when tested according to ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
3. Service Temperature: Up to 250 degrees F (121 degrees C).
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.

- 5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch (13 mm) Thickness: 0.30.
 - b. 1 inch (25 mm) Thickness: 0.45.
 - c. 1-1/2 inches (40 mm) Thickness: 0.60.
- C Adhesive: Waterproof, fire-retardant type, ASTM C916.
- D Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that ducts have been tested before applying insulation materials.
- B Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C Insulated ducts conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor) ((below 3 meters above finished floor)): Finish with canvas jacket sized for finish painting.
- E Duct and Plenum Liner Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage.

2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

- A Supply, Return and Outside Air Intake Ducts, and Plenums located in unconditioned spaces:
1. Flexible Glass Fiber Duct Insulation: 2-1/2" thick or minimum R-6 (installed).
 2. Rigid Glass Fiber Duct Insulation: 1-1/2" thick or minimum R-6 (installed).
 3. Rigid Glass Fiber Duct Liner Insulation: 1-1/2" thick where indicated on drawings.
- B Supply, Return, Exhaust, and Outside Air Ducts and Plenums above insulated ceilings or located in attics:
1. Flexible Glass Fiber Duct Insulation: 2-1/2" thick or minimum R-6 (installed).
 2. Rigid Glass Fiber Duct Insulation: 1-1/2" thick or minimum R-6 (installed).
 3. Rigid Glass Fiber Duct Liner Insulation: 1-1/2" thick where indicated on drawings.

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Piping insulation.
- B Flexible removable and reusable blanket insulation.
- C Jackets and accessories.
- D Engineered wall outlet seals and refrigerant piping insulation protection.

1.02 RELATED REQUIREMENTS

- A Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B Section 078400 - Firestopping.
- C Section 232300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

- A ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- C ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- D ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- E ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2026.
- F ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- G ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

- H ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.
- I ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- J ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension; 2016 (Reapproved 2021).
- K ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- L ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.
- M ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- N ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- O ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- P ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- Q ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- R ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- S ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- T UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

- C Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A Maintain ambient conditions required by manufacturers of each product.
- B Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

- A Manufacturers:
 - 1. CertainTeed Corporation.
 - 2. Johns Manville Corporation.
 - 3. Knauf Insulation.
 - 4. Owens Corning Corporation.
 - 5. Substitutions: See Section 016000 - Product Requirements.

- B Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D Vapor Barrier Lap Adhesive: Compatible with insulation.
- E Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- F Fibrous Glass Fabric:
- G Indoor Vapor Barrier Finish:
 - 1. Vinyl emulsion type acrylic, compatible with insulation, black color.
- H Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- I Insulating Cement: ASTM C449.

2.03 POLYETHYLENE

- A Manufacturers:
 - 1. Armacell LLC
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
 - 1. K (Ksi) Value: ASTM C177; 0.25 at 75 degrees F (0.036 at 24 degrees C).
 - 2. Maximum Service Temperature: 300 degrees F (150 degrees C).
 - 3. Density: 2 lb/cu ft (32 kg/cu m).
 - 4. Maximum Moisture Absorption: 1.0 percent by volume.

5. Moisture Vapor Permeability: 0.05 perm inch (0.073 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A Manufacturer:
1. Aeroflex USA, Inc; Aerocel ULP
 2. Armacell LLC; AP Armaflex
 3. K-Flex USA LLC; K-Flex Titan
- B Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 3. Connection: Waterproof vapor barrier adhesive.
- C Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS

- A PVC Plastic.
1. Manufacturers:
 - a. Johns Manville Corporation
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil (0.25 mm).
 - e. Connections: Brush on welding adhesive.
 3. Covering Adhesive Mastic: Compatible with insulation.

2.06 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

- A Manufacturers:

1. Airex Manufacturing, Inc; ____: www.airexmfg.com/#sle.
 2. Substitutions: See Section 016000 - Product Requirements.
- B Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.
1. Pipe Penetration Wall Seal: Airex Titan Outlet.
 2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.
 3. Pipe Penetration Wall Seal and Insulation Protection System: Airex Pro-System Kit.
- C Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
1. Outlet Cover Color: Gray.
 2. Water Penetration: Comply with ASTM E331.
 3. Air Leakage: Comply with ASTM E283.
 4. Air Permeance: Comply with ASTM E2178.
- D Insulation Protection System: Refrigerant piping insulation PVC protective cover.
1. PVC Insulation Cover Color: Black with full-length velcro fastener.
 2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
 3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
 4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
 5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.
 6. Carbon Arc Light Exposure: Comply with ASTM G153.
 7. Tensile Strength After UV Exposure and Water Immersion: Comply with ASTM D412.
 8. Water Absorption of Plastics: Comply with ASTM D570.
 9. Adhesive free.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that piping has been tested before applying insulation materials.
- B Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Exposed Piping: Locate insulation and cover seams in least visible locations.
- C Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- E For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- F Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- G Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
- H Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.
- I Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located

on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

J INTERIOR INSULATION APPLICATION SCHEDULE

1. Service: Condensate drain piping.
 - a. Operating Temperature: 35 to 75 deg F.
 - b. Insulation Material: Flexible elastomeric.
 - c. Insulation Thickness: 1".
 - d. Field-Applied Jacket: None.
 - e. Vapor Retarder Required: Yes.
 - f. Finish: None.
2. Service: Refrigerant suction and hot-gas piping.
 - a. Operating Temperature: 35 to 50 deg F.
 - b. Insulation Material: Flexible Elastomeric.
 - c. Insulation Thickness: Apply the following insulation thicknesses:
 - d. Insert additional subparagraphs below if more size ranges are required. Select or insert pipe material to suit Project.
 - e. Steel or Copper Pipe, Up to 4" diameter: 1" INSULATION THICKNESS
 - f. Field-Applied Jacket: None.
 - g. Vapor Retarder Required: No.
 - h. Finish: None.

K EXTERIOR INSULATION APPLICATION SCHEDULE (ABOVEGROUND OUTSIDE OF BUILDING)

1. Service: Refrigerant suction.
 - a. Operating Temperature: 35 to 50 deg F.
 - b. Insulation Material: Flexible elastomeric.
 - c. Insulation Thickness: Apply the following insulation thicknesses:
 - d. Insert additional subparagraphs below if more size ranges are required. Select or insert pipe material to suit Project.
 - e. Steel or Copper Pipe, Up to 4" diameter: 2" INSULATION THICKNESS
 - f. Field-Applied Jacket: None.
 - g. Vapor Retarder Required: Yes.
 - h. Finish: None.

END OF SECTION

SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Air Supply System:
- B Dampers.
- C Damper Operators:
 - 1. Electric operators.
- D Input/Output Sensors:
 - 1. Temperature sensors.
 - 2. Humidity sensors.
- E Thermostats:
 - 1. Electric room thermostats.
 - 2. Room thermostat accessories.

1.02 RELATED REQUIREMENTS

- A Section 230548 - Vibration and Seismic Controls for HVAC.
- B Section 230923 - Direct-Digital Control System for HVAC.
- C Section 233300 - Air Duct Accessories: Installation of automatic dampers.
- D Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.
- E Section 262726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

- C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- D NEMA BS 31032 - Residential Controls–Electrical Wall-Mounted Room Thermostats; 2025.
- E NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- F UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D Manufacturer's Instructions: Provide for all manufactured components.
- E Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- F Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.

1.05 QUALITY ASSURANCE

- A Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 AIR SUPPLY SYSTEM

2.03 DAMPERS

- A Performance: Test in accordance with AMCA 500-D.
- B Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch (2.66 mm).
- C Blades: Galvanized steel, maximum blade size 8 inches (200 mm) wide, 48 inches (1200 mm) long, minimum 22 gage, 0.0299 inch (0.76 mm), attached to minimum 1/2 inch (13 mm) shafts with set screws.
- D Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.
- E Leakage: Less than one percent based on approach velocity of 2000 ft per min (10 m per sec) and 4 inches wg (1.0 kPa).
- F Maximum Pressure Differential: 6 inches wg (1.5 kPa).
- G Temperature Limits: Minus 40 to 200 degrees F (Minus 40 to 93 degrees C).

2.04 DAMPER OPERATORS

- A General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
- B Electric Operators:
 - 1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.
- C Inlet Vane Operators:

2.05 INPUT/OUTPUT SENSORS

- A Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F (26 degrees C).
3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
4. Temperature Sensing Device: Compatible with project DDC controllers.
5. Performance Characteristics:
 - a. Room Temperature Sensors with Integral Digital Display:
 - 1) Construct for surface.
 - 2) Provide a four button keypad with the following capabilities:
 - (a) Indication of space and outdoor temperatures.
 - (b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
 - (c) Display and control fan operation status.
 - (d) Manual occupancy override and indication of occupancy status.
 - (e) Controller mode status.
 - (f) Password enabled setpoint and override modes.

2.06 THERMOSTATS

- A Unit Air Handler - programmable thermostat
- B VRF System - main central controller with remote wall mounted thermostats.
- C Room Thermostat Accessories:
 1. Thermostat Covers: _____.
 2. Insulating Bases: For thermostats located on exterior walls.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify existing conditions before starting work.
- B Verify that systems are ready to receive work.
- C Beginning of installation means installer accepts existing conditions.

- D Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F Ensure installation of components is complementary to installation of similar components.
- G Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Check and verify location of thermostats with plans and room details before installation. Locate 60 inches (1500 mm) above floor or if required by ADA Guidelines. Align with lighting switches. Refer to Section 262726.
- C Provide thermostats in aspirating boxes in front entrances and shared public spaces.
- D Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MAINTENANCE

- A Provide service and maintenance of control system for one year from Date of Substantial Completion.
- B Provide complete service of controls systems, including call backs, and submit written report of each service call.
- C In addition to normal service calls, make minimum of ____ complete normal inspections of approximately ____ hours duration to inspect, calibrate, and adjust controls.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Piping.
- B Refrigerant.
- C Moisture and liquid indicators.
- D Valves.
- E Strainers.
- F Filter-driers.
- G Flexible connections.
- H Engineered wall seals and insulation protection.
- I Exterior penetration accessories.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 083100 - Access Doors and Panels.
- C Section 099123 - Interior Painting.
- D Section 230716 - HVAC Equipment Insulation.
- E Section 230719 - HVAC Piping Insulation.
- F Section 236213 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units.
- G Section 236313 - Air Cooled Refrigerant Condensers.
- H Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.

- B AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.
- C AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers; 2013 (Reapproved 2014).
- D AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.
- E AHRI 760 - Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.
- F ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- G ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).
- H ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- I ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2024.
- J ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- K ASME B31.9 - Building Services Piping; 2025.
- L ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025, with Errata.
- M ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- N ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- O ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- P ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- Q ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- R ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- S ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

- T ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- U ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- V ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- W ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- X AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- Y ICC (IMC)-2018 - International Mechanical Code; 2018.
- Z MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.04 SYSTEM DESCRIPTION

- A Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
- D Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

- C Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- F Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- G Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.
- H Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.
- B Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Deliver and store piping and specialties in shipping containers with labeling in place.
- B Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A Comply with ASME B31.9 for installation of piping system.

- B Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- C Welders Certification: In accordance with ASME BPVC-IX.
- D Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.02 PIPING

- A Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B Copper Tube to 7/8 inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.
- C Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.03 REFRIGERANT

- A Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.04 MOISTURE AND LIQUID INDICATORS

- A Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.05 VALVES

2.06 STRAINERS

2.07 FILTER-DRIERS

- A Performance:
 1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
 2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
 3. Design Working Pressure: 350 psi (2410 kPa), minimum.
- B Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C Construction: UL listed.
 1. Connections: As specified for applicable pipe type.

2.08 FLEXIBLE CONNECTORS

- A Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches (230 mm) long with copper tube ends; for maximum working pressure of 500 psi (3450 kPa).

2.09 ENGINEERED WALL SEALS AND INSULATION PROTECTION

- A Manufacturers:

- 1. Airex Manufacturing, Inc; ____: www.airexmfg.com/#sle.

- B Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.

- 1. Pipe Penetration Wall Seal: Airex Titan Outlet.
 - 2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.
 - 3. Pipe Penetration Wall Seal and Insulation Protection System: Airex Pro-System Kit.

- C Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.

- 1. Outlet Cover Color: Gray.
 - 2. Water Penetration: Comply with ASTM E331.
 - 3. Air Leakage: Comply with ASTM E283.
 - 4. Air Permeance: Comply with ASTM E2178.

- D Insulation Protection System: Mechanical line insulation and PVC cover.

- 1. PVC Insulation Cover Color: Black with full-length velcro fastener.
 - 2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
 - 3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
 - 4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
 - 5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.
 - 6. Adhesive free.

2.10 EXTERIOR PENETRATION ACCESSORIES

- A Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

PART 3 EXECUTION

3.01 PREPARATION

- A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B Remove scale and dirt on inside and outside before assembly.
- C Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A Install refrigeration specialties in accordance with manufacturer's instructions.
- B Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C Install piping to conserve building space and avoid interference with use of space.
- D Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- G Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
 2. Support horizontal piping as indicated.
 3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 7. Provide copper plated hangers and supports for copper piping.
- H Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- I Provide clearance for installation of insulation and access to valves and fittings.
- J Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 083100.
- K Flood piping system with nitrogen when brazing.
- L Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 099123.
- M Insulate piping and equipment; refer to Section and Section 230716.
- N Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- P Fully charge completed system with refrigerant after testing.
- Q Provide electrical connection to solenoid valves. Refer to Section 260583.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Test refrigeration system in accordance with ASME B31.5.

- C Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

3.04 SCHEDULES

A Hanger Spacing for Copper Tubing.

1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).
2. 1-1/8 inch (29 mm) OD: Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6.3 mm).
3. 1-3/8 inch (35 mm) OD: Maximum span, 7 feet (2100 mm); minimum rod size, 3/8 inch (9.5 mm).
4. 1-5/8 inch (41 mm) OD: Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Metal ductwork.
- B Nonmetal ductwork.
- C Casings and plenums.
- D Duct cleaning.

1.02 RELATED REQUIREMENTS

- A Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B Section 078400 - Firestopping.
- C Section 099113 - Exterior Painting: Weld priming, weather resistant, paint or coating.
- D Section 099123 - Interior Painting: Weld priming, paint or coating.
- E Section 230130.51 - HVAC Air-Distribution System Cleaning: Cleaning ducts after completion of installation.
- F Section 230593 - Testing, Adjusting, and Balancing for HVAC.
- G Section 230713 - Duct Insulation: External insulation and duct liner.
- H Section 233300 - Air Duct Accessories.
- I Section 233700 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

- A ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.
- B ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.
- C ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

- D ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2026.
- E ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.
- F ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- H ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- I ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- J ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- K ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- L ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- M ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- N ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- O NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- P NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- Q SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- R SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.
- S UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

- T UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide data for duct materials.
- C Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems.
- D Sheet Metal Shop Drawings: After coordination with trades, prepare CAD-generated drawings at minimum 3/8 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Duct layout indicating sizes and pressure classes.
 3. Reflected ceiling plans, room names and numbers.
 4. Major building and structural elements.
 5. Major equipment and piping for Mechanical Rooms.
 6. Elevations of top and bottom of ducts.
 7. Dimensions of main duct runs from building grid lines.
 8. Elevation views, locating dimensions from column lines or other references.
 9. Duct acoustical lining or external insulation.
 10. Fittings.
 11. Reinforcement and spacing.
 12. Seam and joint construction.
 13. Penetrations through fire-rated and other partitions.
 14. Equipment installation based on equipment being used on Project.
 15. Duct accessories, including access doors and duct-mounted equipment such as fire, smoke, automatic control and balancing dampers, sound attenuators,

humidifiers, airflow measuring stations, airflow control valves, smoke detectors and fans.

16. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
 17. Interferences between ductwork and piping, lights, structure or any specialty systems.
- E Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension assembly members.
 2. Other systems installed in same space as ducts including piping, conduit, cable, support trays and other specialty systems.
 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- F Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).
- G Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.
- C All ductwork shall be free from pulsation, chatter and vibration. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork at no additional cost to the Owner.
- D Close the open ends of ducts during construction to prevent dirt and debris from entering.

- E Touch-up all welded and scratched galvanized steel surfaces with zinc-rich paint.
- F Duct leakage testing shall be performed under Division 23 and documented using SMACNA or other approved protocols.

1.06 FIELD CONDITIONS

- A Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B Ducts: Galvanized steel, unless otherwise indicated.
- C Low Pressure Supply and Outside Air (Heating Systems): 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- D Low Pressure Supply and Outside Air (System with Cooling Coils): 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- E Return and Relief: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- F General Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- G Outside Air Intake: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

2.02 MATERIALS

- A Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14.
Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 2. VOC Content: Not more than 250 g/L, excluding water.
 3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 4. For Use with Flexible Ducts: UL labeled.
 5. Manufacturers:
 - a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant.
 - b. Design Polymerics; 1010: www.designpoly.com.com/#sle.
 - c. Ductmate Industries, Inc, a DMI Company
 - d. Substitutions: See Section 016000 - Product Requirements.
- D Gasket Tape: Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle rings connections.
- E Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- F Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.03 DUCTWORK FABRICATION

- A Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

- D Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- E Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- G Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A Round Ducts: Round lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
- B Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
 - 1. UL labeled.
 - 2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 - 3. Pressure Rating: 4 inches wg (1000 Pa) positive and 0.5 inches wg (175 Pa) negative.
 - 4. Maximum Velocity: 4000 fpm (20.3 m/sec).
 - 5. Temperature Range: Minus 20 degrees F to 175 degrees F (Minus 28 degrees C to 79 degrees C).
- C Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 1. Manufacturers:
 - a. Carlisle HVAC Products.
 - b. Ductmate Industries, Inc, a DMI Company.
 - c. MKT Metal Manufacturing.
 - d. Substitutions: See Section 016000 - Product Requirements.
- D Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

1. Manufacturers:
 - a. Ductmate Industries, Inc, a DMI Company.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 CASINGS AND PLENUMS

- A Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.
- B Mount floor mounted casings on 4 inch (100 mm) high concrete curbs. At floor, rivet panels on 8 inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gauge, 0.0478 inch (1.21 mm) expanded metal mesh supported at 12 inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.
- C Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
- D Fabricate acoustic casings with reinforcing turned inward. Provide 16 gauge, 0.0598 inch (1.52 mm) sheet steel back facing and 22 gauge, 0.0299 inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers. Construct panels 3 inches (75 mm) thick packed with 4.5 lb/cu ft (72 kg/cu m) minimum glass fiber insulation media, on inverted channels of 16 gauge, 0.0598 inch (1.52 mm) sheet steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A Install, support, and seal ducts in accordance with SMACNA (DCS).
- B Install in accordance with manufacturer's instructions.
- C During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D Flexible Ducts: Connect to metal ducts with draw bands.
- E Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where

openings are provided in insulated ductwork, install insulation material inside a metal ring.

- G Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- I Use double nuts and lock washers on threaded rod supports.
- J Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.
- K Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- L At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.02 CLEANING

- A See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.03 LEAKAGE TESTING

- A Leak test each ductwork system before ductwork is insulated and concealed.
 - 1. Test all ductwork. For positively-pressurized ductwork follow general procedures (Chapter 4) and use apparatus (Chapter 6) as outlined in the referenced SMACNA HVAC Air Duct Leakage Test Manual. For negatively-pressurized ductwork, follow general procedures (Chapter 4) and use apparatus (Chapter 6) as outlined in the referenced SMACNA HVAC Air Duct Leakage Test Manual, except that the test blower shall exhaust air from the ductwork being tested.
 - 2. Duct construction pressure classifications for all ductwork are shown in the DUCT ASSEMBLIES. Test all ductwork at 100 percent of the specified pressure classifications.
 - 3. The maximum allowable leakage shall be the percent of total rated airflow (cfm) capacity for each ductwork system at SMACNA duct class 3 in. wg.

4. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are installed in duct systems shall be included as part of the duct systems leakage allowance and tested accordingly. Air leakage for equipment, such as fans, air handling units and terminal boxes, has been accounted for separately and all equipment has been specified to meet specific air leakage criteria. Independently leak test all equipment after installation to assure compliance with Specifications and shall isolate this equipment during ductwork leak testing. As an alternate, equipment may be leak tested as part of the duct system, provided that this is noted on the report forms and that leakage rate allowances for ductwork and equipment are identified separately on the forms.
5. If tests show that ductwork leakage is greater than that allowed, ductwork shall be resealed and retested until allowable leakage is not exceeded, at no additional cost to the Owner. All tests may be witnessed and results verified by the Owner's Representative. Submit field test report certifying that the ductwork does not exceed the maximum allowable leakage.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Air turning devices/extractors.
- B Backdraft dampers - metal.
- C Combination fire and smoke dampers.
- D Duct access doors.
- E Duct test holes.
- F Fire dampers.
- G Flexible duct connectors.
- H Smoke dampers.
- I Volume control dampers.
- J Low leakage (Class 1A) control dampers.
- K Miscellaneous products:
 - 1. Damper operators.
 - 2. Damper position switch.
 - 3. Duct opening closure film.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 230548 - Vibration and Seismic Controls for HVAC.
- C Section 233100 - HVAC Ducts and Casings.
- D Section 253513 - Integrated Automation Actuators and Operators: Damper operators.
- E Section 253516 - Integrated Automation Sensors and Transmitters: Damper position switch.

- F Section 253523 - Integrated Automation Control Dampers: Product furnishing.

1.03 REFERENCE STANDARDS

- A AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- C NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- E UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- F UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- G UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- H UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.
- I UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- E Project Record Drawings: Record actual locations of access doors and test holes.
- F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

- A Manufacturers:
 - 1. Carlisle HVAC Products.
 - 2. Krueger-HVAC, Division of Air System Components.
 - 3. Titus HVAC, a brand of Johnson Controls.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 BACKDRAFT DAMPERS - METAL

- A Manufacturers:
 - 1. Nailor Industries, Inc.
 - 2. Ruskin Company.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- B Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

2.04 DUCT ACCESS DOORS

A Manufacturers:

1. Acudor Products Inc, a Division of Nelson Industrial Inc.
2. Ductmate Industries, Inc, a DMI Company.
3. MKT Metal Manufacturing.
4. Nailor Industries, Inc.
5. Ruskin Company.
6. SEMCO LLC.
7. Substitutions: See Section 016000 - Product Requirements.

B Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch (25 mm) thick insulation with sheet metal cover.

1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.

C Access doors with sheet metal screw fasteners are not acceptable.

2.05 DUCT TEST HOLES

- A Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.06 FIRE DAMPERS

A Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc.
2. Nailor Industries, Inc.
3. NCA, a brand of Metal Industries Inc.
4. Pottorff.

5. Ruskin Company.
 6. Substitutions: See Section 016000 - Product Requirements.
- B Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C Ceiling (Radiation) Dampers: Galvanized steel, 22 gage, 0.0299 inch (0.76 mm) frame and 16 gage, 0.0598 inch (1.52 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
1. Boot Fitting: Factory-provided el type (90 degree). Include field-provided collar.
 2. Box Fitting: Factory-provided 26 gage, 0.0179 inch (0.45 mm) with field-provided collar.
 3. Rated for one hour service in compliance with UL 555C.
- D Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- E Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch (250 Pa) pressure class ducts up to 12 inches (300 mm) in height.
- F Multiple Blade Dampers: 16 gage, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.07 FLEXIBLE DUCT CONNECTORS

- A Manufacturers:
1. Carlisle HVAC Products.
 2. Ductmate Industries, Inc, a DMI Company.
 3. Substitutions: See Section 016000 - Product Requirements.
- B Fabricate in accordance with SMACNA (DCS) and as indicated.
- C Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
 - a. Net Fabric Width: Approximately 2 inches (50 mm) wide.
 2. Metal: 3 inches (75 mm) wide, 24 gage, 0.0239 inch (0.61 mm) thick galvanized steel.
- D Leaded Vinyl Sheet: Minimum 0.55 inch (14 mm) thick, 0.87 lbs per sq ft (4.2 kg/sq m), 10 dB attenuation in 10 to 10,000 Hz range.
- E Maximum Installed Length: 14 inch (356 mm).

2.08 SMOKE DAMPERS

- A Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.09 VOLUME CONTROL DAMPERS

- A Products furnished per Section 253523.
- B Fabricate in accordance with SMACNA (DCS) and as indicated.
- C Splitter Dampers:
1. Material: Same gage as duct to 24 inches (600 mm) size in either direction, and two gages heavier for sizes over 24 inches (600 mm).
 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 3. Operator: Minimum 1/4 inch (6 mm) diameter rod in self aligning, universal joint action, flanged bushing with set screw .
- D Single Blade Dampers:
1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
 2. Blade: 24 gage, 0.0239 inch (0.61 mm), minimum.
- E Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gage, 0.0478 inch (1.21 mm), minimum.
- F End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- G Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

2.10 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

- A Manufacturers:
1. Ruskin Company.
 2. Substitutions: See Section 016000 - Product Requirements.
- B Maximum Leakage Allowed: 3 cfm/sf at 1 inch wg (15.2 lps/sm at 0.25 kPa).
- C Frame:
1. Material: 12 gage galvanized steel.
 2. Free-area: Single cross section.
 3. Blanked-off: Split frame into two free-area sections to allow a smaller free-area to be used for a minimum airflow intake or exhaust application and secondary free-area fully blanked-off.
- D Blade:
1. Type: Single-blade rectangle shape.
 2. Operation: Opposed type.
 3. Maximum Individual Blade Height: 8 inches (203 mm).
 4. Material: 12 gauge galvanized steel.
 5. Authority: Opposed type, 5 to 50 percent (typically 10 percent).

- E Insulation: Water-resistant sound absorbing material.
- F Temperature Service Range: Minus 25 to 185 degrees F (minus 32 to 85 degrees C).
- G Other Requirements:
 - 1. Rust Inhibitor Coating: Moisture and salt water-resistant.

2.11 MISCELLANEOUS PRODUCTS

- A Damper manual operators furnished per Section 253513.
- B Damper position switch furnished per Section 253516.
- C Fire-Rated Enclosures:
 - 1. Provide as required to preserve fire resistance rating of building elements.
- D Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
 - 1. Thickness: 2 mils (0.6 mm).
 - 2. High tack water based adhesive.
 - 3. UV stable light blue color.
 - 4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.01 PREPARATION

- A Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.
- B Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and

elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

- D Provide duct test holes where indicated and required for testing and balancing purposes.
- E Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G Demonstrate re-setting of fire dampers to Owner's representative.
- H At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
 - 1. Refer to Section 230548.
- J For fans developing static pressures of 5.0 inches (1250 Pa) and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.
- K Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- L Use splitter dampers only where indicated.
- M Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A Diffusers:

1. Rectangular ceiling diffusers.

B Registers/grilles:

1. Ceiling-mounted, egg crate exhaust and return register/grilles.
2. Ceiling-mounted, exhaust and return register/grilles.
3. Ceiling-mounted, supply register/grilles.
4. Wall-mounted, supply register/grilles.
5. Wall-mounted, exhaust and return register/grilles.

C Wall and ceiling gypsum board access panels.

D Louvers:

E Gravity ventilators.

1.02 RELATED REQUIREMENTS

- A Section 099123 - Interior Painting: Painting of ducts visible behind outlets and inlets.**

1.03 REFERENCE STANDARDS

- A AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).**
- B AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.**
- C AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).**
- D AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.**
- E ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.**

- F ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2025.
- G NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- H NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- I SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C Project Record Documents: Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

- A Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B Test and rate louver performance in accordance with AMCA 500-L.
- C Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A Carnes, a division of Carnes Company Inc.
- B Krueger-HVAC.
- C Metalaire, a brand of Metal Industries Inc.
- D Price Industries.
- E Titus, a brand of Air Distribution Technologies.
- F Tuttle and Bailey.

- G Substitutions: See Section 016000 - Product Requirements.

2.02 DIFFUSERS, REGISTERS, AND GRILLES:

A Manufacturers:

1. Krueger-HVAC
2. Metalaire, a brand of Metal Industries Inc.
3. Price Industries.
4. Titus, a brand of Air Distribution Technologies.
5. Substitutions: See Section 016000 - Product Requirements.

B Refer to schedules on drawings for types and models.

C Type: Provide square, stamped, multi-core, square, adjustable pattern, stamped, multi-core, square and rectangular, multi-louvered, square and rectangular, adjustable pattern, and multi-louvered diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.

D Connections: As indicated on drawings.

E Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.

F Color: As selected by Architect from manufacturer's full range.

G Accessories: Provide volume control damper; operating rod extension and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.03 WALL SUPPLY REGISTERS/GRILLES

A Manufacturers:

1. Krueger-HVAC.
2. Price Industries.
3. Titus, a brand of Air Distribution Technologies.

- B Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical face, single deflection.
- C Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.
- D Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.
- E Fabrication: Aluminum extrusions with factory clear lacquer finish.
- F Color: To be selected by Architect from manufacturer's standard range.
- G Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

2.05 LOUVERS

2.06 GRAVITY VENTILATORS

PART 3 EXECUTION

3.01 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D Install diffusers to ductwork with air tight connection.
- E Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- F Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

END OF SECTION

SECTION 238126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Air-source heat pumps.
- B Air cooled condensing units.
- C Indoor air handling (fan and coil) units for ducted systems.
- D Controls.

1.02 REFERENCE STANDARDS

- A AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2026.
- B AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- D ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- E NEMA MG 00001 - Motors and Generators; 2024.
- F NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- G NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- H UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

- C Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D Design Data: Indicate refrigerant pipe sizing.
- E Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- F Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.05 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
 - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B Performance Requirements: See Drawings for additional requirements.

2.02 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

- A Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Air Flow Configuration: Upflow.
 - 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
 - 1. Motor: NEMA MG 1; 1750 rpm multiple speed, permanently lubricated, hinge mounted.
 - 2. Motor Electrical Characteristics:
- C Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.
- D Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturers: System manufacturer.

2.03 OUTDOOR UNITS

- A Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- C Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- D Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B Verify that proper power supply is available and in correct location.
- C Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B Install in accordance with NFPA 90A and NFPA 90B.
- C Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 260000 - GENERAL REQUIREMENTS FOR DIVISION 26 WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 1 Specification Sections apply to work of this Division.

1.02 DESCRIPTION OF THE WORK

- A Provide under this Division of the Specification a complete electrical system, fully adjusted, tested, and commissioned for use as indicated on the Drawings and as specified herein.

- B Work Specified in This Division:

260000 General Requirements for Division 26 Work

260100 Basic Electrical Materials and Methods

260200 Service Equipment

260519 Low-voltage Electrical Power Conductors and Cables

260526 Grounding and Bonding for Electrical Systems

260529 Hangers and Support for Electrical Systems

260533.13 Conduit for Electrical Systems

260533.16 Boxes for Electrical Systems

260553 Identification for Electrical Systems

260583 Wiring Connections

260923 Lighting Control Devices

262416 Distribution Panelboards, Branch Circuit Panelboards and Load Centers

262726 Wiring Devices

262813 Fuses

262816.16 Enclosed Switches

265100 Interior Lighting

- C The Contractor shall examine all other Divisions of the Specification to determine the full extent of related work required to be performed under this Division. Failure to do so will not relieve the Contractor of responsibility to perform all work required for a complete and satisfactory installation.
- D The Contractor shall recognize that various electrical communication equipment originate within and/or connect and/or interface with electrical equipment in other buildings at this location/building complex. The Contractor shall be responsible to verify that he is fully aware of the amount of wiring/cabling that must be routed from this building to any other building that has been constructed or is being constructed together with this building. Particular attention must be taken in the implementation of Specifications:
- E The Contractor shall recognize that various electrical communication equipment originate within and/or connect and/or interface with electrical equipment in other buildings at this location/building complex. The Contractor shall be responsible to verify that equipment and systems are protected from the effects of multiple grounds and from the effects of lightning strikes to the building complex.

1.03 CODES AND STANDARDS

- A Codes and Standards listed below, insofar as they apply, form a part of these Specifications, the same as if they were fully written and shall be followed as minimum requirements. Where standards conflict, that standard with the more stringent requirements shall be applicable. This shall not be construed as relieving the Contractor from providing the highest grade of material and workmanship specified.
- B The Contractor shall give written notice to the Architect of any materials or apparatus believed in violation of laws, ordinances, rules or regulations, or Authorities Having Jurisdiction.
- C All equipment shall comply with all applicable requirements of laws, codes, ordinances, legislation, etc., of all Federal, State, and Local Authorities, whether or not indicated on the Contract Documents.
- D The referenced codes shall include any and all supplements, addenda, memoranda, information bulletins and any other changes and additions effective prior to the Date of Substantial Completion by adoption of the local Authority Having Jurisdiction.
- E Modifications required by the Authorities Having Jurisdiction shall be made without additional charge to the Owner.

- F Where alterations to and/or deviations from the Contract Documents are required by the Authorities, report the requirements to the Architect and secure his approval before starting the alterations.
- G Where Contract Documents' requirements are in excess of Code requirements and are permitted under the Code, the Contract Documents shall govern.
- H All rules and regulations of the Underwriters Laboratories shall be complied with whether or not indicated in the Contract Documents. Provide Division 26 equipment having UL labels or labeled by an independent testing agency acceptable to the Authority Having Jurisdiction.
- I All work shall comply with the following codes and standards.
 - 1. Codes:
 - 2. New Jersey Adopted Version of IECC, 2021 Edition.
 - 3. New Jersey Adopted Version of ASHRAE 90.1, 2019 Edition.
 - National Electrical Code, 2020 edition.
 - 4. Standards:
 - National Fire Protection Association (NFPA).
 - Underwriters Laboratories, Inc. (UL).
 - American National Standards Institute (ANSI).
 - National Electrical Manufacturers Association (NEMA).

1.04 PERMITS

- A The Contractor shall be responsible for obtaining and paying for all permits, licenses, and inspection certificates required for all work in accordance with the provisions of the Contract Documents.

1.05 DEFINITIONS

- A "Provide": to supply, install and make complete, safe, and operable, the particular work referred to unless specifically indicated otherwise.
- B "Install": to erect, mount and make complete with all related accessories.

- C "Furnish" or "supply": to purchase, procure, acquire, and deliver complete with related accessories.
- D "Work": includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.
- E "Wiring": includes raceway, fittings, wire, boxes, and all related accessories.
- F "Concealed": not in view, installed in masonry or other construction, within furred spaces, double partitions, hung ceilings, trenches, crawl spaces, or enclosures.
- G "Exposed": in view, not installed underground or "concealed" as defined above.
- H "Indicated," "shown," or "noted": as indicated, shown or noted on drawings or specifications.
- I "Similar" or "equal": of base bid manufacturer, equal in quality, materials, weight, size, performance, design and efficiency of specified product, conforming with "Base Bid Manufacturers."
- J "Reviewed," "satisfactory," "accepted," or "directed": as reviewed, satisfactory, accepted, or directed by or to Architect and/or Engineer.

1.06 GUARANTEE

- A The Contractor will guarantee in form satisfactory to the Owner, that all Work installed will be free from any and all defects in workmanship and materials for a period of one year, to include one full heating and one full cooling season, from the date of certification of substantial completion or acceptance by the Owner, whichever is later. Guarantee that all apparatus will develop capacities and characteristics specified.
- B During the guarantee period the Contractor shall remedy defective workmanship, materials, and apparatus performance, without cost to the Owner, within a reasonable time to be specified by the Owner. In default thereof, the Owner may have such work done and charge all costs to the Contractor in accordance with the General conditions of the Contract and Division 1.
- C Provide product warranties as specified in the various Sections of this Division. Minimum product warranty shall be one year.

1.07 COMPLETE PERFORMANCE OF WORK

- A Work shall be executed in strict accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen.

- B Provide labor, materials, apparatus, and appliances essential to the complete functioning of the systems described and indicated or which may be reasonably implied as essential whether mentioned in the Contract Documents or not.
- C In cases of doubt as to the Work intended, or in the event of need for explanation thereof, the Contractor shall request supplementary instructions from the Architect.
- D Provide skilled journeymen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper installation of the Work of this Division.

1.08 COOPERATION WITH OTHER TRADES

- A Contractor shall coordinate efforts of all trades and shall furnish (in writing, with copies to the Architect and Owner) any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B Where the work of various trades will be installed in close proximity to one another, or where there is evidence that the work of one trade will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. Prior to the execution, procurement or fabrication of any work, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4-inch = 1-foot 0-inch clearly showing work of all trades. If the Contractor allows one trade to install his work before coordinating with work of other trades, the Contractor shall make necessary changes to correct the condition without extra charge.

1.09 DRAWINGS

- A The Drawings show the general layout of the various items of equipment. However, layout of equipment, accessories, specialties, conduit, etc. are diagrammatic unless specifically dimensioned, and do not necessarily indicate every required fitting, junction box, pull box, relay or similar items required for a complete installation. Consult the Architectural Drawings and details for exact location of fixtures and equipment. Where same is not definitely located, obtain the information from the Architect before proceeding.
- B The Contractor shall follow the Drawings in laying out the work and check drawings of all trades to verify spaces in which work will be installed. Maintain maximum headroom and where space conditions appear inadequate, the Architect shall be notified before proceeding with the installation.
- C Any apparatus, appliance, material or work not shown on the Drawings but mentioned in the Specifications, or vice versa, shall be provided by the Contractor without additional expense to the Owner.

- D Where variances occur between the Drawings and the Specifications, or within either document itself, the items or arrangement of better quality, greater quantity, or higher cost shall be included in the contract price. The Contractor shall request clarification in writing from the Architect on which item and manner in which the work shall be installed.

1.10 SURVEYS AND MEASUREMENTS

- A The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site, and check the corrections of same as related to the Work and submittals.
- B Should the Contractor discover any discrepancy between actual measurements and those indicated which would prevent following intent of the Drawings and Specifications, he shall notify the Architect and shall not proceed until he has received interpretations from the Architect.

1.11 EQUIPMENT FURNISHED BY OTHERS

- A When so specified or shown, the Contractor shall install any equipment furnished by others.
- B The Contractor shall receive at the site, unload, uncrate, store, protect, set in place, and connect up completely any such equipment or fixtures which require electrical service connections. All such connections shall be in accordance with the Manufacturer's recommendations and these Specifications.
- C The Contractor shall consult Manufacturer's literature and inspect the actual piece of equipment or fixture to determine roughing in dimensions and locations for all services.
- D The Contractor shall exercise special care in handling and protecting such equipment and fixtures and shall be responsible for the cost of replacing any such equipment or fixtures which are missing; and for the cost of repairing any damage to each piece of equipment and fixtures or finished work, caused by mishandling or failure to protect on the part of the Contractor.

1.12 CONFERENCE PRIOR TO START OF WORK

- A Immediately upon the award of this Contract, but prior to commencing any Work, the Contractor together with designated major subcontractors shall confer with the Architect and Engineer concerning the Work under this Contract.
- B The conference will be held at a mutually agreed place and acceptable time.

1.13 PROTECTION

- A The Contractor shall maintain protection of the Work and materials during construction from theft, injury or damage.
- B The Contractor shall carefully store material and equipment received on site which are not immediately installed.
- C The Contractor shall provide temporary covers on enclosures as required during construction to prevent damage.
- D The Contractor shall be responsible for all work and equipment on project until inspected, tested and accepted by the Owner.
- E Any equipment damaged shall be refinished back to original condition or replaced at the Architect's/Engineer's discretion.

1.14 MANUFACTURER'S RECOMMENDATIONS

- A With exceptions as specified or indicated in the Contract Documents, apply, install, connect, erect, use, clean, and condition manufactured articles, materials, and equipment per manufacturer's current printed recommendations. Keep copies of such printed recommendations at job site.

1.15 SPACE LIMITATIONS

- A Equipment has been chosen which will fit into the physical spaces provided and indicated, and allow for access, servicing, removal and replacement of parts, etc. The Contractor shall provide adequate space for clearance in accordance with the Code requirements and the requirements of the local Authorities Having Jurisdiction for all equipment, including "future equipment" to be installed at a later date.
- B In the preparation of Contract Documents, a reasonable effort to accommodate specified Equipment Manufacturers' space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for access and proper fit rests with the Contractor.
- C Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's review.
- D The Contractor shall be responsible for confirming the sufficiency of the size of shafts and chases, the adequate thickness of partitions and adequate clearance in double partitions and hung ceilings for the proper installation of his work. Such spaces and clearances shall be kept to the minimum size required.

1.16 SUBMITTALS

- A After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain complete submittals from the manufacturers, suppliers, vendors, subcontractors, sub-subcontractors, for all materials and equipment specified in this Division and submit data and details of such materials and equipment to the Architect and Engineer.
- B Prior to forwarding submittals to the Architect and Engineer, the Contractor shall review and stamp all submittals to indicate that the equipment, materials, methods, etc. represented by the submittals are in compliance with the Contract Documents prior to submission.
- C The Contractor shall check all materials and equipment after their arrival on the job site and verify their compliance with approved submittal and the Contract Documents.
- D A period of two weeks, exclusive of transmittal time, will be required in the Engineer's office each time a submittal is submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling his work.
- E Submittal Types:
 - 1. Product data submittal: Manufacturers' literature or sample which the Contractor intends to provide for the Project. Product data submittals will be reviewed for compliance with the information shown and the design concept expressed in the Contract Documents. Approval of a specific item does not constitute approval of an assembly of which the item is a component. Submit equipment operating data, general arrangement, materials of construction, etc.
 - 2. Quality control submittal: Shop drawing of an assembly of components with construction dimensions and details as appropriate. The Contractor is responsible for construction means, methods, techniques, sequences and procedures and for the accuracy of dimensions, quantities, substantiating instructions for installations of equipment and systems.
 - 3. Contract closeout submittals: Information required at substantial completion of the Project. Contract closeout submittals will be reviewed for conformance with the specified content.
- F Approval of product data shall not relieve the Contractor of the responsibility for errors that may be contained therein, or for deviations from requirements in the Contract Documents. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the product data the Contract Documents shall govern the work and are neither waived nor superseded in any way by submittal review.

- G For each submittal, the Contractor shall provide a cover sheet on his business letterhead which consist of:
1. Whether or not item being submitted is the "Basis of Design", "Alternate Specified Item" or "Substitute Item" as indicated in the Contract Documents.
 2. In the event that the item or equipment being submitted is not the "Basis of Design", Contractor shall state that they have reviewed the Contract Documents and will provide any modifications or revisions to the Contract required to properly install the equipment. This shall be accomplished at no additional cost to the Owner, in compliance with Section 260000-2.02 "Materials."
- H Provide submittals with the following:
1. Cover sheet with submittal title, submittal number, name of Project, names of Architect, Engineer, Contractor, Subcontractor, manufacturer, supplier/vendor, the submittal date, the dates of any revisions, and the applicable spec section and paragraph numbers.
 2. Clear identification of each manufacturer.
 3. Irrelevant catalog information deleted.
- I Provide submittals in the following quantities.
1. Product data submittals: as specified in Division 1.
 2. Quality control submittals: two copies; one for the Architect's file and one for the Engineer's file. Provide two (2) additional copies for the Owner.
 3. Contract closeout submittals: minimum of two copies or as specified in the various sections; both approved copies will be turned over to the Owner.
- J The Contractor shall maintain one complete, up-to-date set of all reviewed submittals and all quality control submittals at the project site. At the conclusion of the project, this submittal file shall be turned over to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

- A Except as may be described in PART 1 and PART 3 of this Section, refer to PART 2 of the various Sections of Specification Division 26, ELECTRICAL.

2.02 MATERIALS

- A The word "Provide" is defined as requiring the Contractor to "furnish, erect, and install complete and commission for use" the item to which it refers.
- B All materials and apparatus required for the work except as specified otherwise, shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as approved by the Architect shall be provided.
- C Where any specific material, process or method of construction, or manufactured article is specified by name or by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance as specified or noted on the Drawings. In all cases, the Contractor shall verify the duty specified with the specific characteristics of the equipment offered for approval.
- D Materials, equipment, etc., used in the Work shall not contain asbestos or PCB's in any form or composition.
- E Equipment designated as "Basis of Design" has been coordinated for structural penetrations; duct, piping, and electrical connection; operating and service (maintenance) requirements; and physical size with regard to space where equipment is housed. Other specified manufacturers of like equipment are acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or configuration of adjoining equipment and the installation that is required to properly install, operate, and service the equipment being used.
- F The Contractor shall provide equipment, materials, etc. from the specified manufacturers. Where no alternate manufacturers are specified the exact make specified shall be provided. The Architect shall have the right to reject any alternative submitted and to insist on the specified material.
- G All component parts of each item of equipment or device shall bear the manufacturers nameplate, giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Subcontractor or Distributor will not be acceptable.
- H Unless otherwise specifically indicated in the Drawings or Specifications, all equipment and materials shall be applied with the approval of the Architect in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

2.03 SUBMITTALS

- A The following equipment shall be by the same manufacturer. Submit this equipment together in a covered binder with each item separated by a tabbed section.
 - 1. Enclosed switches
 - 2. Transformers
 - 3. Panelboards

PART 3 - EXECUTION

3.01 COORDINATION

- A The Contractor shall assure full cooperation of all trades and shall furnish in writing all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B Where necessary, prepare composite working drawings at a suitable scale not less than 1/4-inch equals one foot, zero inches, clearly showing how the work of this Division is to be installed in relation to the work of all trades. Any work installed in conflict with the work of other trades shall be corrected at no additional cost to the Owner.
- C The Contractor may, subject to the acceptance of the Architect and without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of all trades or for the proper execution of the work.
- D Electrical Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Coordinate with the Architectural Drawings and details for exact location of fixtures and equipment.
- E The Contractor shall follow Drawings in layout work and shall coordinate all trades to verify spaces in which work shall be installed. Maintain maximum headroom or space conditions. Where space conditions appear inadequate, the Architect shall be notified before installation. Do not proceed with the installation until receiving clarifying instructions.

3.02 SLEEVES, PLATES, AND INSERTS

- A The sleeves, plates, and inserts shall be carefully located in advance of the construction of walls, slabs, and decks.
- B Sleeves shall be provided for all conduit passing through metal decks or concrete slabs. Sleeves shall be provided for all conduit passing through masonry, concrete, tile, and gypsum wallboard construction.

- C Sleeves in concrete floor slabs may be Schedule 40 P.V.C. pipe.
- D Fasten sleeves securely in slabs, decks, and walls so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other material from being forced into the space between conduit and sleeves during construction.
- E Where sleeves are placed through slabs, decks, or fire-rated wall construction and following placing of electrical service therein, resulting opening and unused sleeves shall be filled with factory built devices or with manufactured fill, void, or cavity materials "Classified" by Underwriters' Laboratories, Inc. for use as a Through-Penetration Firestop. All firestop devices and systems shall be approved for such use by the authority having jurisdiction. The fire safing system used shall maintain the fire resistance rating of the building component that is penetrated. Fire safing systems and devices shall comply with ASTM E 814 (UL 1479). Submittal data for fire safing systems shall include the U.L. System Numbers listed in the U.S. Building Materials Directory under which the material was tested in accordance with ASTM E 814 (UL 1479) for use in a Through-Penetration Firestop System. Excessive shrinkage of the fire stopping materials which would permit the transmission of smoke or water prior to exposure to a fire condition is unacceptable. Where a mastic coating is used to seal the surface of the firestop, the mastic shall be non-hardening. The fire safety system used shall accommodate expansion and contraction without damaging the firestop or reducing its effectiveness as a smoke barrier or water seal. Approved firestop sealing component/systems are as follows:
 - 1. Tremco Fire-Resistive Joint System using Dymeric sealant and Cerablanket-FS mineral filler.
 - 2. Dow Corning 3-6548 Silicone RTV Foam.
 - 3. 3M Fire Barrier Penetration Sealing Systems (Electro Products Divisions).
 - 4. STI Pensil PEN200 Silicone RTV Foam.
 - 5. T&B Flame-Safe Fire Retardant Products.
- F Sleeves penetrating walls below grade shall be standard weight black steel pipe with 1/4 inch thick steel plate secured to the pipe with continuous fillet weld. The plate shall be located in the middle of the wall and shall be four inches wider all around than the sleeve it encircles. The entire assembly shall be hot dipped galvanized after fabrication. Seal off annular opening between conduit and sleeve with "Link Seal" casing seal as manufactured by GPT, a division of EnPro Industries. The pipe sleeve shall be sized to accommodate the GPT casing seal. Casing seals shall be Series LS-300 for conduit size 3/4 inches through 4 inches and Series LS-400 for conduit sizes 5 inches and longer.
- G Check floor and wall construction finishes to determine proper length of sleeves for various locations and make actual lengths to suit the following.

1. Terminate sleeves flush with walls, partitions, and ceilings. Sheet metal thimbles of adequate strength to resist deformation by construction materials may be used in non-structural walls and ceilings.
 2. In areas where conduits are concealed, as in chases, formed penetrations may be used.
 3. In area where conduits are exposed, extend sleeves 2 inches above finished floor.
- H Sleeves through beams or within 30 inches of column center lines shall be ASTM A-500 or A-501 steel pipe. All other sleeves shall be Schedule 40, ASTM A-120 galvanized or black steel pipe where required by structural engineer or where required to extend above the floor.

3.03 EXCAVATING AND BACKFILLING

- A Excavation as required to acceptably install work covered in this Division of the Specifications shall be provided as a portion of the work of this Division.
- B It shall be the responsibility of the Contractor to check the indicated elevations of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect shall be notified of such conditions before excavations are commenced.
- C Contractor shall be responsible for backfilling areas indicated but not used by utility companies.
- D Excavation and backfill shall be as specified in the Earthwork section of the Architectural Specifications.

3.04 ACCESSIBILITY

- A The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to motors, controllers, switchgear, junction boxes, etc. If required for better accessibility, furnish access door for this purpose. Minor deviations from Drawings may be made to allow for better accessibility, but any change must be noted and approved by the Architect before proceeding with the work.
- B It shall be the responsibility of the trade installing any concealed equipment needing access to provide access panels for each item requiring service. Access panels shall be coordinated with the material in which it shall be installed. Access panels are specified in the Architectural section.

- C Access panels shall be provided where shown on the Drawings and otherwise where required for service of equipment. All required locations for access panels not shown on Drawings shall be submitted by the Contractor to the Architect for review. No access panels shall be installed until its location is reviewed and accepted by the Architect. The Contractor shall make reasonable modifications to his work in order to provide acceptable access panel locations.
- D Wherever access is required through walls or ceilings to motors, controllers, pull boxes, or other concealed equipment installed under this Division, the Contractor shall provide a hinged access door and frame as follows:
 - 1. Drywall construction - Milcor Style AT, or as approved by Architect, with drywall insert and casing beads.
 - 2. Finished acoustical tile ceiling - Milcor Style AT, or as approved by Architect.
 - 3. Finished plaster ceiling - Milcor Style AP, or as approved by Architect.
 - 4. Finished plaster walls or ceramic tile - similar to doors required for finished acoustical tile ceiling.
 - 5. Access doors shall be "B" label fire construction where required.

3.05 EQUIPMENT NOISE AND VIBRATION

- A It is the intention to specify and for the Contractor to provide equipment and systems that, as defined herein, shall be quiet and free of apparent vibration in operation.
- B It is intended that vibration shall not be apparent to the senses in occupied areas of the building. To this end, both the balancing of rotating machinery and the installation of vibration isolation at various locations are required.
- C It shall be the responsibility of the Contractor to obtain equipment that is quiet in operation as compared to other available equipment of this size, capacity, and type; to install equipment so that a minimum amount of noise and/or vibration is transmitted to the building.
- D Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the work of the Contractor, subject to review by the Engineer and without additional cost to the Owner. After the system is in operation, it shall be the responsibility of the Contractor to make any changes to equipment or work installed that may be required to provide a system which is quiet in operation as defined herein.
- E The system noise level shall be equal to or less than NC40.

3.06 LUBRICATION

- A Provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a lubrication tube with suitable fitting to an accessible location and suitably identify it.
- B After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated with a lubricant recommended by the equipment manufacturer, until the Owner issues a certificate of substantial completion for the equipment, item or system.

3.07 ELECTRICAL CONNECTIONS

- A General:
 - 1. The Contractor shall familiarize himself with all sections of these Specifications in order to provide necessary electrical connections to all equipment. Such equipment shall be connected, complete, and ready for operation in accordance with manufacturer's recommendations. Where such connections are made using a receptacle and cap, the necessary pigtail shall be provided.
 - 2. Safety disconnect switches shall be provided for all motors or equipment as required by the N.E.C. whether shown on the Drawings or not.
 - 3. Temperature control wiring in general shall be installed under the section specifying the equipment, unless specifically indicated on the Electrical Drawings. Under this section, power shall be provided where indicated to serve such systems as indicated.
 - 4. Individual temperature control devices, such as thermostats which directly control unit heaters, float switches, etc., shall be supplied and connected under the section specifying the equipment.
 - 5. The electrical subcontractor shall provide all wiring, with the exception of the following.
 - a. Equipment control wiring, except for smoke control.
 - b. Interlock wiring.
 - 6. Provide all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. Install all starters not factory mounted on equipment.
 - 7. All control, signal, interlock, and equipment control wiring, regardless of voltage, shall be installed in raceway system unless specifically indicated or specified otherwise.

8. Provide all fire alarm system and smoke control wiring, regardless of voltage. Install in separate raceway systems as specifically specified in the fire alarm system section.
9. Provide all power connections for heat-taped equipment and piping and extend proper connections to locations coordinated with supplier.

3.08 FIELD OBSERVATIONS

- A Work identified as requiring corrective action by the Contractor is considered not to be in compliance with the Contract Documents.
 1. The Contractor shall provide prompt written notice to the Architect outlining what remedial measures are to be taken to correct each noted deficiency and the date the corrective action will be available for re-examination.
 2. The Contractor is responsible for scheduling remedial work in a timely fashion so that the corrected work may be re-examined. Uncovering work for the purpose of checking corrective actions will be at the cost of the Contractor regardless of the acceptability of the remedial work.
 3. The Contractor shall provide the Architect a minimum of five regular working days notice, exclusive of transmittal time, of the date corrective action is available for re-examination.

3.09 OPERATING INSTRUCTIONS

- A The Contractor shall provide the services of a factory trained specialist to supervise the start-up of all equipment specified in this Division and to instruct the Owner's operators for 2 - 8-hour day(s) operating instruction period. The operating instruction period shall cover all major Division 26 equipment and all Division 26 systems and be defined as straight time working hours and shall not include nights, weekends, or travel time to and/or from the project. See individual Sections for additional instructions required of Manufacturer's trained specialists.
- B All instruction periods shall be video taped by the Contractor in digital format. Upon completion of all instruction periods, Contractor shall provide record video files to the Owner.
- C The Owner shall be notified in writing at least five days before each operating instruction period begins. The Contractor shall commence no instruction period until the Owner has issued his written acceptance of the starting time.
- D At the conclusion of the operating instruction period(s) the Contractor shall submit to the Owner a separate certification letter signed by each instructor identifying the system

and/or equipment covered in the instruction period, the duration, and that the equipment was in proper operating condition at the time of the instructions. The Owner or his authorized representative shall counter-sign these certifications attesting to the completeness of the instruction period and shall forward copies of the counter-signed certificate to the Architect for his files.

3.10 OPERATING AND MAINTENANCE MANUALS

- A The Contractor shall provide operating instructions and maintenance data manuals for each specific item of equipment and materials provided under this Division.
- B Submit operating and maintenance data manuals for review at least four weeks before systems' start-up. Assemble all data in a completely indexed three-ring binder(s).
- C Maintenance manuals shall include the minimum following information. Refer to individual sections of this Division for specific additional requirements.
 - 1. Identifying name and Contract Document designation.
 - 2. Equipment section shall include corrected copies of all product data submittals manufacturer operations, parts manuals and written maintenance instructions for each individual piece of equipment.
 - 3. Local source for parts and service.
 - 4. Locations (where several similar items are used, provide a list).
 - 5. Complete nameplate data.
 - 6. Complete lubrication, cleaning, and servicing data.
 - 7. Parts lists with diagrams.
 - 8. Wiring diagrams.
 - 9. Troubleshooting guides.
 - 10. Manufacturer's recommended operating and maintenance instructions with all non-applicable information deleted.
 - 11. Panel schedules (8 1/2 x 11 copies)

3.11 RECORD DRAWINGS

- A The Contractor shall maintain on a daily basis at the project site a complete set of "Record Drawings" reflecting an accurate as-built record of all Work. In addition, the

"Record Drawings" shall be marked to show the precise location of hidden-from-view work and equipment, including, but not limited to, concealed or embedded raceways, junction boxes, pull-boxes, and all changes and deviations in the Work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite instructions from the Architect.

1. The "Record Drawings" shall consist of a complete set of the Contractor's quality control submittals.
 2. The Contractor shall utilize the Division 26 Contract Drawings as the basis for Record Drawings of that portion of the Work where no submittals were required, (i.e., equipment schedules, schematics, etc.). All references to member firms of the design team shall be blacked-out on Contract Drawings used for Record Drawings.
 3. The Contractor is responsible for all reproduction costs associated with Record Drawings.
 4. Drawings shall show all conduit paths (1-1/2" and larger unless specified otherwise) with installation details included and all raceways labeled as to use.
 5. All work outside the limits of the building shall show exact location and depth below grade of all raceways, duct banks and direct buried cables.
- B Record dimensions shall clearly and accurately delineate all Division 26 base building and tenant Work provided; locations shall be suitably identified by at least two dimensions to permanent structures.
- C The Contractor shall mark all "Record Drawings" on the front lower right hand corner with a rubber stamp impression that states the following:

"RECORD DRAWINGS. To be used for recording Field Deviations and Dimensional Data Only."

- D Upon completion of work, the Contractor shall certify the "Record Drawings" for correctness by providing and signing the following certification:

"CERTIFIED CORRECT

(Name of Contractor)

By:

Date:

(Name of Electrical Subcontractor)

By:

Date: "

- E Prior to testing of the Work of this Division, the Contractor shall forward properly certified reproducible "Record Drawings" to the Architect as a quality control submittal in accordance with the requirements of paragraph 1.15 of this Section.

3.12 START-UP

- A At a time designated by the Owner, all Work provided by Division 26 shall be operated by the Contractor to demonstrate to the Owner compliance with the Contract Documents. The Contractor shall provide all materials, test equipment, utilities, etc., and sufficient responsible and knowledgeable personnel from each related trade as required to demonstrate proper systems' operation.
 - 1. This start-up test shall be in addition to the requirements for Contractor tests, Code officials inspection tests and operating instructions.
 - 2. The Contractor shall supervise, conduct, and document the start-up tests.
 - 3. The date for the start-up tests shall be prior to the anticipated date of Substantial Completion and in sufficient time to permit proper and full execution of the tests prior to that date. Any adjustments and/or alterations which the start-up tests indicate as necessary for the proper functioning of all equipment shall be completed prior to the date of Substantial Completion.
 - 4. The Contractor shall provide a detailed schedule of completion indicating when each system is to be completed and outlining when and how tests will be performed. Completion schedule and test procedures shall be submitted for review at least 60 days prior to the anticipated date of system start-up.
- B All Division 26 systems shall be operated properly with loads balanced among phases and controls adjusted. All labels shall be removed and the lighting fixtures shall be clean and in operating condition.
 - 1. Work found not operating in accordance with the requirements specified in the Contract Documents shall be corrected and additional start-up tests made, all at no additional cost to the Owner.
- C The Contractor shall submit to the Architect certificates and documents required herein at least sixty days prior to the start-up tests, unless specified otherwise.
 - 1. The Code Authority must have signed off for final approval and occupancy of project.

2. All system tests as required by this Division must be performed and accepted.
3. Provide test reports, as contract closeout submittal type, as required by Section Specification work for the following electrical systems.
 - a. Grounding System.
 - b. Wire and Cable.
 - c. Generator and Transfer Switches.
4. O&M manuals submitted.
5. Record (AS-Built) drawings submitted.
6. On-site operating instructions and factory start-up complete and specified documentation submitted.
7. Thorough cleaning of all systems, equipment and spaces.
8. All systems identification complete.
9. All electrical connections complete and free from short circuits.
10. All Field Report and Punch List work complete.

END OF SECTION

SECTION 260100 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A This Section includes the following:
 - 1. Supporting devices for electrical components.
 - 2. Electrical identification.
 - 3. Electricity-metering components.
 - 4. Concrete equipment bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

1.03 SUBMITTALS

- A Product Data: For electricity-metering equipment.
- B Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.04 QUALITY ASSURANCE

- A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B Comply with NFPA 70.

1.05 COORDINATION

- A Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors." Coordinate this work with the Architect.
- E Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 PRODUCTS

2.01 SUPPORTING DEVICES

- A Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
 - 1. Channel Thickness: Selected to suit structural loading.

- 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- D Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- G Expansion Anchors: Carbon-steel wedge or sleeve type.
- H Toggle Bolts: All-steel springhead type.

2.02 ELECTRICAL IDENTIFICATION

- A Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
 - 2. Color: Black letters on orange background.
 - 3. Legend: Indicates voltage.
- C Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).
- D Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend that indicates type of underground line.

- E Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.
- H Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- I Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm), galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch (6-mm) grommets in corners for mounting.
- J Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.03 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A Coordination: Coordinate all utility company requirements with the utility company prior to installation.
- B Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- C Meter Sockets: Comply with requirements of electrical power utility company.
- D Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses. Coordinate cold- or hot-sequencing with utility company
 - 1. Housing: NEMA 250, Type 1 enclosure .
 - 2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 22,000-A interrupting capacity, minimum.

2.04 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

- A Meter: Electronic kilowatt-hour measuring to record electricity used.
 - 1. Kilowatt-Hour Display: Digital liquid crystal.
 - 2. Kilowatt-Demand Display: Digital, liquid-crystal type to register highest peak demand.
 - 3. Enclosure: NEMA 250, Type 1, minimum, with hasp for padlocking or sealing.
 - 4. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
 - 5. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.
 - a. Type: Solid core.
 - 6. Accuracy: Nationally recognized testing laboratory certified to meet ANSI C12.1 specifications.
 - 7. Demand Signal Communication Interface: Match signal to building automation system input that conveys data on instantaneous/integrated demand level measured by meter used for load switching to control demand.
- B Current-Transformer Cabinets: Listed or recommended by metering equipment manufacturer for use with sensors indicated.

2.05 CONCRETE BASES

- A Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete ."
- B Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.06 TOUCHUP PAINT

- A For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

- A Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B Dry Locations: Steel materials.
- C Support Clamps for PVC Raceways: Click-type clamp system.
- D Selection of Supports: Comply with manufacturer's written instructions.
- E Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.03 SUPPORT INSTALLATION

- A Install support devices to securely and permanently fasten and support electrical components.
- B Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

- F Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I Simultaneously install vertical conductor supports with conductors.
- J Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.04 IDENTIFICATION MATERIALS AND DEVICES

- A Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C Self-Adhesive Identification Products: Clean surfaces before applying.
- D Identify raceways and cables with color banding as follows:
 1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
- E Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common
- G Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.

- 4. Neutral: White
- 5. Ground: Green
- H Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- I Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.05 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

- A Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.06 FIRESTOPPING

- A Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.07 CONCRETE BASES

- A Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.08 CUTTING AND PATCHING

- A Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been

disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.09 FIELD QUALITY CONTROL

- A Inspect installed components for damage and faulty work, including the following:
 - 1. Supporting devices for electrical components.
 - 2. Electrical identification.
 - 3. Electricity-metering components.
 - 4. Concrete bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.
- B Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
 - 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
 - 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
 - 3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
 - 4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
 - 5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.10 REFINISHING AND TOUCHUP PAINTING

- A Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

- A On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 260200 - SERVICE EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 1 Specification Sections apply to work of this Section.

1.02 DESCRIPTION OF THE WORK

- A Provide the electrical service entrance and duct bank requirements as shown on the drawings and specified.

1.03 STANDARDS

- A Coordinate all work for electric service with the local power company servicing the Project and provide service entrance duct banks, pads, racking and conductors to the transformer to their standards and regulations.

1.04 SUBMITTALS

- A Quality Control Submittals:
 - 1. Service and equipment shop drawings showing the arrangement in plan and elevation of all metering, and main service equipment duct banks.
 - 2. Drawings shall include manufacturer's name, ratings, physical dimensions, electrical ratings and all other pertinent layout information to include verification of clearance in designated room or space.
- B Contract Closeout Submittals:
 - 1. Record drawings
 - 2. Documentation of inspections by, and tests performed for the Authority Having Jurisdiction.

PART 2 - REQUIREMENTS

2.01 MANUFACTURERS

- A Basis of Design: Square D Company.
- B Acceptable Manufacturers: If it complies with these specifications and meets the dimensional requirements of the project, products by the following manufacturers will be acceptable.
 - 1. Siemens Energy and Automation
 - 2. Eaton Corporation: Cutler-Hammer Products
- C Substitutions are not permitted.

2.02 ELECTRIC SERVICE

- A Provide electric service as shown on the drawings and as specified.
- B Electric Service Costs:
 - 1. The contractor shall provide all fees, labor and materials associated with bringing service to the facility.
- C Main Service Equipment:
 - 1. Provide main service equipment of the size and type indicated on the drawings, this equipment shall bear a UL label for service entrance equipment.
 - 2. Confirm available short circuit current from the utility company and provide all service equipment with AIC ratings that exceed the available short circuit current at the particular pieces of equipment.

PART 3 - EXECUTION

3.01 INSPECTION

- A Check all shop drawings provided to ensure all work required to be performed by the Contractor meets all requirements.

3.02 CLEANING

- A Clean all dirt and debris from the inside of all raceways for service entrance cables.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Single conductor building wire.
- B Underground feeder and branch-circuit cable.
- C Metal-clad cable.
- D Wiring connectors.
- E Electrical tape.
- F Heat shrink tubing.
- G Oxide inhibiting compound.
- H Wire pulling lubricant.
- I Cable ties.
- J Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A Section 078400 - Firestopping.
- B Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
- E Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.
- F Section 312316 - Excavation.
- G Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- H Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
- F ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).
- G ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.
- H ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- I ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- J FM 3971 - Fire Protective Coatings and Wraps for Grouped Cables; 2019.
- K FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).
- L IEEE 383 - IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities; 2015.
- M IEEE 1210 - IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable; 2004 (Corrigendum 2014).
- N IEEE 1210 - IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable; 2004 (Corrigendum 2014).
- O NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- P NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

- Q NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- R NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2024.
- S NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- T NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- U NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- V UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- W UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- X UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- Y UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Z UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- AA UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- BB UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- CC UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- DD UL 719 - Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.
- EE UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- FF UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C Wire Pulling Lubricant: Certification of compatibility with conductors/cables where used with the following insulation/jacket types:
- D Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.
- B Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 FIELD CONDITIONS

- A Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A Provide products that comply with requirements of NFPA 70.
- B Provide products listed, classified, and labeled as suitable for the purpose intended.
- C Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D Comply with NEMA WC 70.
- E Comply with FS A-A-59544 where applicable.
- F Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H Conductors for Grounding and Bonding: Also comply with Section 260526.
- I Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J Conductor Material:
 - 1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

K Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.

L Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

M Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - d. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A Manufacturers:

1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. General Cable Technologies Corporation: www.generalcable.com/#sle.
 - d. Service Wire Co: www.servicewire.com/#sle.
 - e. Southwire Company: www.southwire.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
- B Description: Single conductor insulated wire.
- C Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 2. Control Circuits: Stranded.
- D Insulation Voltage Rating: 600 V.
- E Insulation:
 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 METAL-CLAD CABLE

- A Manufacturers:
 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 2. Encore Wire Corporation: www.encorewire.com/#sle.
 3. Service Wire Co: www.servicewire.com/#sle.
 4. Southwire Company: www.southwire.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- B Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
 2. Size 8 AWG and Larger: Stranded.
- D Insulation Voltage Rating: 600 V.
- E Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F Provide oversized neutral conductors where indicated or required.
- G Provide dedicated neutral conductor for each phase conductor where indicated or required.
- H Grounding: Full-size integral equipment grounding conductor.
- I Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

- A Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B Connectors for Grounding and Bonding: Comply with Section 260526.
- C Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
 3. Connectors for Aluminum Conductors: Use compression connectors.
- D Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

- 4. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
- 5. Conductors for Control Circuits: Use crimped terminals for all connections.
- E Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- H Mechanical Connectors: Provide bolted type or set-screw type.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
- I Compression Connectors: Provide circumferential type or hex type crimp configuration.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- J Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 - 1. Manufacturers:
 - a. Burndy LLC: www.burndy.com/#sle.
 - b. IlSCO: www.ilsco.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORIES

A Electrical Tape:

1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

B Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Burndy LLC: www.burndy.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

C Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

1. Manufacturers:

- a. Burndy LLC: www.burndy.com/#sle.
- b. Ideal Industries, Inc: www.idealindustries.com/#sle.
- c. IlSCO: www.ilsco.com/#sle.

D Wire Pulling Lubricant:

- 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. American Polywater Corporation: www.polywater.com/#sle.
 - c. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- 2. Listed and labeled as complying with UL 267.
- 3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
- 4. Suitable for use at installation temperature.
- 5. Products:
 - a. American Polywater Corporation; Polywater J Cable Pulling Lubricant: www.polywater.com/#sle.
 - b. American Polywater Corporation; Polywater LZ Cable Pulling Lubricant: www.polywater.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

E Cable Ties: Material and tensile strength rating suitable for application.

- 1. Manufacturers:
 - a. Burndy LLC; _____: www.burndy.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

F Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

- 1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

G Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

- 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

- H Fire-Protective Coating for Electrical Conductors and Cables: Field-applied, intumescent or ablative coating designed to prevent ignition and propagation of fire along thermoplastic-insulated conductors and cables.
 - 1. Pass flammability tests of one of the following:
 - a. ASTM E84, Class A; maximum flame spread index of 25.
 - b. FM 3971.
 - c. IEEE 383.
 - 2. Products:
 - a. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that interior of building has been protected from weather.
- B Verify that work likely to damage wire and cable has been completed.
- C Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D Verify that field measurements are as indicated.
- E Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
 9. Provide oversized neutral/grounded conductors where indicated.
- B Install products in accordance with manufacturer's instructions.
- C Perform work in accordance with NECA 1 (general workmanship).
- D Install aluminum conductors in accordance with NECA 104.
- E Install nonmetallic-sheathed cable (Type NM-B) in accordance with NECA 121.
- F Install metal-clad cable (Type MC) in accordance with NECA 120.
- G Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- H Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.

2. Protect cables from physical damage.
- I Direct Burial Cable Installation:
1. Provide trenching and backfilling in accordance with Section 312316 - Excavation and Section 312323 - Fill.
 2. Install cable with minimum cover of 24 inches (610 mm) unless otherwise indicated or required.
 3. Protect cables from damage in accordance with NFPA 70.
 4. Provide underground warning tape in accordance with Section 260553 along entire cable length.
- J Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- K Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- L Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- M Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- N Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- O Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- P Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

- Q Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- R Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 3. Wet Locations: Use heat shrink tubing.
- S Insulate ends of spare conductors using vinyl insulating electrical tape.

- T Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- U Identify conductors and cables in accordance with Section 260553.
- V Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- W Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect and test in accordance with NETA ATS, except Section 4.
- C Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Grounding and bonding requirements.
- B Conductors for grounding and bonding.
- C Connectors for grounding and bonding.
- D Ground bars.
- E Ground rod electrodes.
- F Chemically-enhanced ground electrodes.
- G Ground plate electrodes.
- H Ground enhancement material.
- I Ground access wells.

1.02 RELATED REQUIREMENTS

- A Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
 - 1. Includes oxide inhibiting compound.
- B Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- C Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.
- D Section 337900 - Site Grounding.

1.03 REFERENCE STANDARDS

- A IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.

- B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- D NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F NFPA 99 - Health Care Facilities Code; 2024, with Errata.
- G NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2026.
- H UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittals procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- D Field quality control test reports including test procedure used; test result that comply with requirements; and result of failed tests and corrective action taken to achieve test results that comply with requirements.
- E Qualifications Data for firms and persons specified in "Quality Assurance" Article.
- F Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.
- B Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Boggs, Inc.
 - c. Chance/Hubbell.
 - d. Copperweld Corp.
 - e. Dossert Corp.
 - f. Erico Inc.; Electrical Products Group.
 - g. Framatome Connectors/Burndy Electrical.
 - h. Galvan Industries, Inc.
 - i. Harger Lightning Protection, Inc.
 - j. Hastings Fiber Glass Products, Inc.
 - k. Heary Brothers Lightning Protection Co.
 - l. Ideal Industries, Inc.
 - m. ILSCO.
 - n. Kearney/Cooper Power Systems.
 - o. Korns: C. C. Korns Co.; Division of Robroy Industries.
 - p. Lightning Master Corp.
 - q. Lyncole XIT Grounding.
 - r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - s. Raco, Inc.; Division of Hubbell.
 - t. Robbins Lightning, Inc.
 - u. Salisbury: W. H. Salisbury & Co.
 - v. Superior Grounding Systems, Inc.
 - w. Thomas & Betts, Electrical.

- E Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- F Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode stranded cable conductors without splice or joint. underground conductors shall be bare, tinned, stranded type unless otherwise noted.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches (750 mm).
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches (600 mm) outside building perimeter foundation.
6. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as

permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

- a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.
9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F Separately Derived System Grounding:

1. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
2. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
3. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

G Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding

terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide green insulated insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
8. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
9. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

H Pole-Mounted Luminaires: Also comply with Section 265600.

2.02 GROUNDING AND BONDING COMPONENTS

A General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

- 1) Use bare copper conductors where installed underground in direct contact with earth.
- 2) Use bare copper conductors where directly encased in concrete (not in raceway).

C Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper bonded.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet (3.0 m) are indicated or otherwise required, sectionalized ground rods may be used.

F Chemically-Enhanced Ground Electrodes:

1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.

2. Length: 10 feet (3.0 m).
3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.

G Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches (200 mm) in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches (300 by 300 mm).
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches (250 mm).
4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that work likely to damage grounding and bonding system components has been completed.
- B Verify that field measurements are as indicated.
- C Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Perform work in accordance with NECA 1 (general workmanship).
- C Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- D In raceways, use insulated equipment grounding conductors.

- E Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- F Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- G Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- H Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- I Underground Grounding Conductors: Use [tinned-] copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.03 EQUIPMENT GROUNDING CONDUCTORS

- A Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B Install equipment grounding conductors in all feeders and circuits.
- C Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by the NEC:
 - 1. Feeders and branch circuits
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.

- D Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- E Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- F X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- G Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- H Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- I Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- J Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- K Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- L Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

- M Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
- N Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.04 COUNTERPOISE

- A Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches (450 mm) below grade and 24 inches (600 mm) from building foundation.

3.05 INSTALLATION

- A Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
- B Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- C Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 2 inches below finished grade.
 - 2. Indoor Installations: Unless otherwise indicated, install with 2 inches of top of rod exposed.
- D Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches (750 mm).
- E Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- F Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- G Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- H Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- I Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- J Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- K Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.
- L Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.
- M For all projects located within the State of New Jersey, bond foundation rebar to grounding electrode system per New Jersey DCA Bulletin No. 02-2 using a clamp listed for the purpose (Blackburn #JDLI or approved listed equal). The bonding point shall remain exposed until installation is inspected and approved by the building code official.

3.06 CONNECTIONS

- A General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.
- F Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A [and UL 486B].
- G Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- I Make grounding and bonding connections using specified connectors.

- J Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
- K Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
- L Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
- M Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
- N Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O Identify grounding and bonding system components in accordance with Section 260553.

3.07 OVERHEAD-LINE GROUNDING

- A Edit six paragraphs below to be consistent with local utility company practice. Coordinate with Drawings.
- B Comply with IEEE C2 requirements. Use 2 or more parallel ground rods if a single ground rod electrode resistance to ground exceeds 25 ohms.
- C Drive ground rods to a depth of 12 inches (300 mm) below finished grade in undisturbed earth.
- D Ground Rod Connections: Use clamp-type connectors listed for the purpose for underground connections and connections to rods.
- E Lightning Arresters: Separate arrester grounds from other grounding conductors.
- F Secondary Neutral and Tank of Transformer: Interconnect and connect to grounding conductor.
- G Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.08 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor

from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

- B Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.
- C Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches (450 mm) below grade and 6 inches (150 mm) from the foundation.

3.09 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect and test in accordance with NETA ATS except Section 4.
- C Perform inspections and tests listed in NETA ATS, Section 7.13.
- D Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F Submit detailed reports indicating inspection and testing results and corrective actions taken.
- G Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:
- H Testing: Engage a qualified testing agency to perform the following field quality-control testing:
- I Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - e. Manhole Grounds: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.10 GRADING AND PLANTING

- A Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- E Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- F Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- G Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

- E ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F MFMA-4 - Metal Framing Standards Publication; 2004.
- G NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- H NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittal procedures.

- B Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
- C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

- c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B Components for Vibration Isolation and/or Seismic Controls: See Section 260548.
- C Materials for Metal Fabricated Supports: See Section 055000.
- D Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 - 1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 - 2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 3. Conduit Clamps: Bolted type unless otherwise indicated.
 - 4. Products:
 - a. Gripple, Inc; Universal Bracket: www.gripple.com/#sle.
 - b. Gripple, Inc; Fast Trak: www.gripple.com/#sle.
 - c. Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.
 - d. Gripple, Inc; Low Profile Bracket Kits: www.gripple.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- E Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
 - 1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- F Metal Channel/Strut Framing Systems:
 - 1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
 - c. Custom Strut and Roll Forming, LLC: www.customstrut.com/#sle.
 - d. Eaton Corporation: www.eaton.com/#sle.
 - e. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
 - g. Source Limitations: Furnish channel/strut and associated fittings, accessories, and hardware produced by single manufacturer.

2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 3. Comply with MFMA-4.
 4. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
 5. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 6. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
 7. Minimum Channel Dimensions: 1-5/8 inch (41 mm) wide by 13/16 inch (21 mm) high.
- G Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2-inch (13 mm) diameter.
 - b. Busway Supports: 1/2-inch (13 mm) diameter.
 - c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
 - d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
 - f. Outlet Boxes: 1/4-inch (6 mm) diameter.
 - g. Luminaires: 1/4-inch (6 mm) diameter.
- H Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Manufacturers:
 - a. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Green Link, Inc: www.greenlinkengineering.com/#sle.
 - d. PHP Systems/Design: www.phpsd.com/#sle.
 2. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
 3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

5. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.

I Anchors and Fasteners:

1. Manufacturers - Mechanical Anchors:
 - a. Dewalt: anchors.dewalt.com/#sle.
 - b. Hilti, Inc: www.hilti.com/#sle.
 - c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
5. Hollow Masonry: Use toggle bolts.
6. Hollow Stud Walls: Use toggle bolts.
7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
8. Sheet Metal: Use sheet metal screws.
9. Wood: Use wood screws.
10. Plastic and lead anchors are not permitted.
11. Powder-actuated fasteners are not permitted.
12. Hammer-driven anchors and fasteners are permitted only as follows:
 - a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction.
 - b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction.
13. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
 - b. Comply with MFMA-4.
 - c. Channel Material: Use galvanized steel.
 - d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
14. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that mounting surfaces are ready to receive support and attachment components.
- C Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Install hangers and supports in accordance with NECA 1.
- C Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H Provide required vibration isolation and/or seismic controls; see Section 260548.
- I Field Welding, Where Approved by Architect: See Section 055000.
- J Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches (80 mm) in height; see Section 033000.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- K Conduit Support and Attachment: See Section 260533.13 for additional requirements.
- L Box Support and Attachment: See Section 260533.16 for additional requirements.
- M Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.
- N Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.
- O Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- P Secure fasteners in accordance with manufacturer's recommended torque settings.
- Q Remove temporary supports.
- R Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements for additional requirements.
- B Inspect support and attachment components for damage and defects.
- C Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion. File ends smooth prior to applying the paint to metal channel supports.
- D Where ends of metal strut are exposed to possible human contact, provide protective plastic end caps approved by the manufacturer.
- E Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Galvanized steel intermediate metal conduit (IMC).
- B Flexible metal conduit (FMC).
- C Liquidtight flexible metal conduit (LFMC).
- D Galvanized steel electrical metallic tubing (EMT).
- E Rigid polyvinyl chloride (PVC) conduit.
- F Electrical nonmetallic tubing (ENT).
- G Liquidtight flexible nonmetallic conduit (LFNC).

1.02 RELATED REQUIREMENTS

- A Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B Section 078400 - Firestopping.
- C Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- D Section 260526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- E Section 260529 - Hangers and Supports for Electrical Systems.
- F Section 260533.16 - Boxes for Electrical Systems.
- G Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- H Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- I Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- J Section 312316 - Excavation.

- K Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- L Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.
- B ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.
- D ASTM D1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal); 2010 (Reapproved 2019).
- E ASTM D1598 - Standard Test Methods for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure; 2021.
- F ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings; 2018.
- G ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.
- H ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing; 2024.
- I ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing; 2016a (Reapproved 2022).
- J ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); 2022a.
- K ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct; 2017.
- L NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- M NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- N NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.

- O NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- P NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- Q NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- R NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit; 2021.
- S NEMA BI 50058 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).
- T NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- U NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).
- V NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2020).
- W NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).
- X NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Y UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- Z UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- AA UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- BB UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- CC UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- DD UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- EE UL 651A - High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.
- FF UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations; Current Edition, Including All Revisions.
- GG UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

- HH UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- II UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.
- JJ UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- KK UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.
- LL UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- MM UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- NN UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements for submittals procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C Project Record Documents: Record actual routing for conduits installed underground and conduits 2-inch (53 mm) trade size and larger.

1.06 DELIVERY, STORAGE, AND HANDLING

- A See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C Underground:
 - 1. Under Slab on Grade: Use rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
 - 4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to heavy wall galvanized steel electrical metallic tubing (EMT) painted with a minimum of two coats of bitumatic paint where in contact with and emerging from underground.
- D Concealed Within Masonry Walls: Use galvanized steel electrical metallic tubing (EMT).

- E Interior, Damp or Wet Locations: Use galvanized steel electrical metallic tubing (EMT).
- F Exposed, Interior, Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

2.02 CONDUIT - GENERAL REQUIREMENTS

- A Comply with NFPA 70.
- B Electrical Service Conduits: See Section 262100 for additional requirements.
- C Fittings for Grounding and Bonding: See Section 260526 for additional requirements.
- D Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E Provide products listed, classified, and labeled as suitable for purpose intended.
- F Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
 - 3. Control Circuits: 3/4-inch (21 mm) trade size.
 - 4. Underground, Interior: 1-inch (27 mm) trade size.
 - 5. Underground, Exterior: 1-inch (27 mm) trade size.
- G Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A Manufacturers:
 - 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 - 2. Nucor Tubular Products: www.nucortubular.com/#sle.
 - 3. Rymco USA: www.rymcousa.com/#sle.

4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
 - c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 3. Material: Use threaded zinc coated steel.
 4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 FLEXIBLE METAL CONDUIT (FMC)

- A Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
 2. Electri-Flex Company: www.electriflex.com/#sle.
 3. International Metal Hose: www.metalhose.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- C Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

- d. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use fittings specifically designed for this conduit for the location where it is installed.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A Manufacturers:

1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C Fittings:

1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use fittings specifically designed for this conduit for the location where it is installed.

2.06 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular/#sle.
3. Rymco USA: www.rymcousa.com/#sle.

4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
 - c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use zinc coated steel.
 4. Connectors and Couplings: Use zinc coated steel and insulated throat. Provide compression type up to 2-inches and for 2 1/2-inch conduit and larger, set screw fittings and compression fittings are acceptable .

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A Manufacturers:
1. ABB; Carlon: www.carlon.com/#sle.
 2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 3. Cantex Inc: www.cantexinc.com/#sle.
 4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
 5. JM Eagle: www.jmeagle.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise

indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 ELECTRICAL NONMETALLIC TUBING (ENT)

A Manufacturers:

1. ABB; Carlon: www.electrification.us.abb.com/#sle.
2. Cantex Inc: www.cantexinc.com/#sle.
3. IPEX, a division of Aliaxis: ww.ipexna.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA BI 50058 and listed and labeled as complying with UL 1653.

C Fittings:

1. Manufacturer: Same as manufacturer of ENT to be connected.
2. Use solvent-welded type fittings.
3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.09 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A Manufacturers:

1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. IPEX, a division of Aliaxis: www.ipexna.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

- B Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- C Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.10 ACCESSORIES

- A Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- E Foam Conduit Sealant:
 - 1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.
 - 4. Products:
 - a. American Polywater Corporation; Polywater AFT Foam Duct Sealant: www.polywater.com/#sle.
 - b. American Polywater Corporation; Polywater FST Foam Duct Sealant: www.polywater.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- F Conduit Mechanical Seals:
 - 1. Listed as complying with UL 514B.
 - 2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.

3. Suitable for sealing around conductors/cables to be installed.
 4. Products:
 - a. American Polywater Corporation; PHRD SG Mechanical Seals: www.polywater-haufftechnik.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- G Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
 3. Products:
 - a. American Polywater Corporation; PZVR Cement-Coated Concrete Wall Sleeves: www.polywater-haufftechnik.com/#sle.
 - b. American Polywater Corporation; PHSD Mechanical Seals: www.polywater-haufftechnik.com/#sle.
 - c. American Polywater Corporation; PHSI 150 Varia Double Wall Inserts: www.polywater-haufftechnik.com/#sle.
 - d. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- H Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
1. Products:
 - a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: www.altaproductsllc.com/#sle.
 - b. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - c. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- I Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
1. Products:
 - a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- J Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:
 - a. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that mounting surfaces are ready to receive conduits.
- B Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Install conduit in accordance with NECA 1.
- C Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- D Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
- E Electrical Nonmetallic Tubing (ENT): Install in accordance with NECA 111.
- F Liquidtight Flexible Nonmetallic Conduit (LFNC): Install in accordance with NECA 111.
- G Conduit Routing:
 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 2. When conduit destination is indicated without specific routing, determine exact routing required.
 3. Conceal conduits unless specifically indicated to be exposed.
 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 5. Unless otherwise approved, do not route exposed conduits:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.

6. Conduits installed underground may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
10. Route conduits above water and drain piping where possible.
11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
13. Group parallel conduits in same area on common rack.

H Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
2. Provide required vibration isolation and/or seismic controls; see Section 260548.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.

8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
9. Use of spring steel conduit clips for support of conduits is not permitted.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

I Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, extend 6-inches above finished floor with cap.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

J Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.
 5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- K Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- L Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- M Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

- N Provide grounding and bonding; see Section 260526.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements for additional requirements.
- B Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C Boxes and enclosures for integrated power, data, and audio/video.
- D Floor boxes.
- E Accessories.

1.02 RELATED REQUIREMENTS

- A Section 033000 - Cast-in-Place Concrete.
- B Section 078400 - Firestopping.
- C Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- D Section 260526 - Grounding and Bonding for Electrical Systems.
- E Section 260529 - Hangers and Supports for Electrical Systems.
- F Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- G Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- H Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- I Section 262726 - Wiring Devices:
 - 1. Wall plates.

2. Floor box service fittings.
3. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

- A NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- D NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- G NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, cabinets and enclosures, and floor boxes.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

12. Wall Plates: Comply with Section 262726.

13. Manufacturers:

- a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
- b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
- c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
- d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
- e. Thomas & Betts Corporation: www.tnb.com/#sle.

C Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

2.02 ACCESSORIES

A Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

1. Manufacturers:
 - a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that mounting surfaces are ready to receive boxes.
- B Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D Provide separate boxes for emergency power and normal power systems.
- E Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
 10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J Install boxes plumb and level.
- K Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L Install boxes as required to preserve insulation integrity.

- M Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- O Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q Close unused box openings.
- R Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S Provide grounding and bonding in accordance with Section 260526.

3.03 CLEANING

- A Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Electrical identification requirements.
- B Identification nameplates and labels.
- C Wire and cable markers.
- D Underground warning tape.
- E Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A Section 099113 - Exterior Painting.
- B Section 099123 - Interior Painting.
- C Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D Section 260573 - Power System Studies: Arc flash hazard warning labels.
- E Section 262300 - Low-Voltage Switchgear: Factory-installed mimic bus.

1.03 REFERENCE STANDARDS

- A ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
- B ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- C NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- E UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

- A Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.

- 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - c. Enclosed switches and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - d. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
 - e. Electricity Meters:
 - 1) Identify load(s) metered.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
4. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Elevator control panels.
5. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

- c. Service Equipment: Include the following information in accordance with NFPA 70.
 - 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Clearing time of service overcurrent protective device(s).
 - 4) Date label applied.

B Identification for Conductors and Cables:

- 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
- 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- 5. Use underground warning tape to identify direct buried cables.

C Identification for Raceways:

- 1. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits.
 - a. Maximum Intervals: 20 feet (6.1 m).
 - b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
 - 1) Field-Painting: Comply with Section 099123 and 099113.
 - 2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
- 2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
- 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

4. Use underground warning tape to identify underground raceways.

D Identification for Boxes:

1. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.
2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc: www.brimar.com/#sle.
 - b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - c. Seton Identification Products: www.seton.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic or stainless steel nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B Identification Labels:

1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C Format for Equipment Identification:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
 - a. System designation where applicable:
 - 1) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1 inch (25 mm).
 - b. Equipment Designation: 1/2 inch (13 mm).
5. Color:
 - a. Normal Power System: White text on black background.
 - b. Fire Alarm System: White text on red background.

D Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.

E Format for Caution and Warning Messages:

1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch (13 mm).

5. Color: Black text on yellow background unless otherwise indicated.

F Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.
2. HellermannTyton: www.hellermannntyton.com/#sle.
3. Panduit Corp: www.panduit.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D Legend: Power source and circuit number or other designation indicated.

E Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F Minimum Text Height: 1/8 inch (3 mm).

G Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

A Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.
 2. Brimar Industries, Inc: www.brimar.com/#sle.
 3. Seton Identification Products: www.seton.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.
- C Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- D Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- E Legend: Type of service, continuously repeated over full length of tape.
- F Color:
1. Tape for Buried Power Lines: Black text on red background.
 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

- A Manufacturers:
1. Brimar Industries, Inc: www.brimar.com/#sle.
 2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
 3. Insite Solutions, LLC: www.stop-painting.com/#sle.
 4. Seton Identification Products: www.seton.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- B Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C Install identification products centered, level, and parallel with lines of item being identified.

- D Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Occupancy sensors.
- B Time switches.
- C Outdoor photo controls.

1.02 RELATED REQUIREMENTS

- A Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B Section 260526 - Grounding and Bonding for Electrical Systems.
- C Section 260529 - Hangers and Supports for Electrical Systems
- D Section 260533.16 - Boxes for Electrical Systems.
- E Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
 - 1. Includes finish requirements for wall controls specified in this section.
 - 2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
- G Section 262813 - Fuses.
- H Section 265100 - Interior Lighting.
- I Section 265600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A 47 CFR 15 - Radio Frequency Devices; current edition.
- B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

- C NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- D NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- E NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- F NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- G NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- I UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- J UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
- K UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- L UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- M UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 - 1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
 - 2. Coordinate placement of wall switch occupancy sensors with installed door swings.
 - 3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
 - 4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.

5. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
6. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A See Section 013000 - Administrative Requirements, for submittal procedures.

B Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
2. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.

D Operation and Maintenance Data: Include detailed information on device programming and setup.

E Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A Provide products listed, classified, and labeled as suitable for purpose intended.
- B Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.
- C Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

- A Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
 - 2. Hubbell Incorporated: www.hubbell.com/#sle.
 - 3. Intermatic, Inc: www.intermatic.com/#sle.
 - 4. Legrand North America, Inc: www.legrand.us/#sle.
 - 5. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 6. RAB Lighting, Inc: www.rablighting.com/#sle.
 - 7. Substitutions: See Section 016000 - Product Requirements.

8. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B General Requirements:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above selected level.
11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

12. Wireless Sensors:

- a. RF Range: 30 feet (9 m) through typical construction materials.
- b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
- c. Power: Battery-operated with minimum ten-year battery life.

C Wall Switch Occupancy Sensors:

1. General Requirements:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
- b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
- c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
- d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
- e. Finish: Color to be selected by Architect.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within area of 400 square feet (37.2 sq m).

4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).

D Wall Dimmer Occupancy Sensors:

1. General Requirements:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
- b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
- c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
- d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
- e. Finish: Color to be selected by Architect.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).

E Ceiling Mounted Occupancy Sensors:

1. General Requirements:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - d. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 square meters) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet (111.5 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet (46.5 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
 - b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet (92.9 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet (111.5 sq m) at mounting height of 9 feet (2.7 m).

F Power Packs for Low-Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

G Power Packs for Wireless Occupancy Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line-voltage loads.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Rating: As required to control load indicated on drawings.

2.03 TIME SWITCHES

A Manufacturers:

1. Intermatic, Inc: www.intermatic.com/#sle.
2. NSI Industries LLC: www.nsiindustries.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.
4. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B Digital Electronic Time Switches:

1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
 - a. Astronomic Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.

9. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 1.

2.04 OUTDOOR PHOTO CONTROLS

A Manufacturers:

1. Intermatic, Inc: www.intermatic.com/#sle.
2. NSI Industries LLC: www.nsiindustries.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.
4. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D Verify that final surface finishes are complete, including painting.
- E Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A Provide extension rings to bring outlet boxes flush with finished surface.
- B Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.
 - 1. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C Maintain separation of remote-control, signaling, and power-limited circuits.
 - 1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.
- D Install lighting control devices in accordance with manufacturer's instructions.
- E Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F Install lighting control devices plumb and level, and held securely in place.
- G Where required and not furnished with lighting control device, provide wall plate; see Section 262726.
- H Provide required supports; see Section 260529.
- I Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- J Occupancy Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K Outdoor Photo Control Locations:
1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.
- L Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.
- M Daylighting Control Photo Sensor Locations:
1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.
- N Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- O Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

3.04 ADJUSTING

- A Adjust devices and wall plates to be flush and level.
- B Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

- D Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.
- F Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.
- G Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.05 CLEANING

- A Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A See Section 017800 - Closeout Submittals, for closeout submittals.
- B See Section 017900 - Demonstration and Training, for additional requirements.
- C Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Power distribution panelboards.
- B Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A Section 260526 - Grounding and Bonding for Electrical Systems.
- B Section 260529 - Hangers and Supports for Electrical Systems.
- C Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.
- D NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- E NEMA PB 1 - Panelboards; 2011.
- F NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.
- G NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- H NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

- J UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K UL 67 - Panelboards; Current Edition, Including All Revisions.
- L UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- M UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- O UL 943 - Ground-Fault Circuit-Interruption; Current Edition, Including All Revisions.
- P UL 1699 - Arc-Fault Circuit-Interruption; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

- C Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- D Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A ABB: www.electrification.us.abb.com/#sle.
- B Eaton Corporation: www.eaton.com/#sle.

- C Schneider Electric: www.se.com/#sle.
- D Siemens Industry, Inc: www.new.siemens.com/#sle.
- E Substitutions: See Section 016000 - Product Requirements.
- F Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A Provide products listed, classified, and labeled as suitable for the purpose intended.
- B Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
- C Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating as indicated on the drawings.
- D Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H Conductor Terminations: Suitable for use with the conductors to be installed.
- I Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: As indicated on the drawings.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:
 - a. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K Provide the following features and accessories where indicated or where required to complete installation:
 1. Feed-through lugs.
 2. Sub-feed lugs.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 6. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

- c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
- 7. Do not use tandem circuit breakers.
- 8. Do not use handle ties in lieu of multi-pole circuit breakers.
- 9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
- 10. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.04 SOURCE QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C Verify that mounting surfaces are ready to receive panelboards.
- D Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Perform work in accordance with NECA 1 (general workmanship).
- B Install products in accordance with manufacturer's instructions.
- C Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

- D Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E Provide required support and attachment in accordance with Section 260529.
- F Install panelboards plumb.
- G Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- H Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- I Provide grounding and bonding in accordance with Section 260526.
- J Install all field-installed branch devices, components, and accessories.
- K Provide filler plates to cover unused spaces in panelboards.
- L Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1. Fire detection and alarm circuits.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect and test in accordance with NETA ATS, except Section 4.
- C Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- E Test GFCI circuit breakers to verify proper operation.
- F Test AFCI circuit breakers to verify proper operation.
- G Test shunt trips to verify proper operation.
- H Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B Adjust alignment of panelboard fronts.
- C Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262813 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Fuses.

1.02 RELATED REQUIREMENTS

- A Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- B Section 262816.16 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.
- E UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.
- F UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- G UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.
- H UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 262816.16.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
- C Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 - Product Requirements, for additional provisions.
 2. Extra Fuses: One set(s) of three for each type and size installed.
 3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.
- B Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.
- B Littelfuse, Inc: www.littelfuse.com/#sle.
- C Mersen: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

A Feeders:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B General Purpose Branch Circuits: Class RK1, time-delay.

C Individual Motor Branch Circuits: Class RK1, time-delay.

2.03 FUSES

- A Provide products listed, classified, and labeled as suitable for the purpose intended.
- B Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C Provide fuses of the same type, rating, and manufacturer within the same switch.
- D Comply with UL 248-1.
- E Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F Voltage Rating: Suitable for circuit voltage.
- G Class R Fuses: Comply with UL 248-12.
- H Class L Fuses: Comply with UL 248-10.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Do not install fuses until circuits are ready to be energized.

B Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A Section 260526 - Grounding and Bonding for Electrical Systems.
- B Section 260529 - Hangers and Supports for Electrical Systems.
- C Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E Section 262813 - Fuses.
- F Section 262913 - Enclosed Controllers: Manual motor controllers.
- G Section 263600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.03 REFERENCE STANDARDS

- A NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

- G UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- D Project Record Documents: Record actual locations of enclosed switches.
- E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A ABB: www.electrification.us.abb.com/#sle.
- B Eaton Corporation: www.eaton.com/#sle.
- C Schneider Electric: www.se.com/#sle.
- D Siemens Industry, Inc: www.new.siemens.com/#sle.
- E Substitutions: See Section 016000 - Product Requirements.
- F Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B Provide products listed, classified, and labeled as suitable for the purpose intended.

- C Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D Horsepower Rating: Suitable for connected load.
- E Voltage Rating: Suitable for circuit voltage.
- F Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G Provide with switch blade contact position that is visible when the cover is open.
- H Fuse Clips for Fusible Switches: As required to accept fuses indicated.
- I Conductor Terminations: Suitable for use with the conductors to be installed.
- J Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N Heavy Duty Switches:

1. Comply with NEMA BS 31047.
2. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position.

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify that field measurements are as indicated.
- B Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C Verify that mounting surfaces are ready to receive enclosed safety switches.
- D Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A Install products in accordance with manufacturer's instructions.
- B Perform work in accordance with NECA 1 (general workmanship).
- C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D Provide required support and attachment in accordance with Section 260529.
- E Provide required seismic controls in accordance with Section 260548.
- F Install enclosed switches plumb.
- G Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- H Provide grounding and bonding in accordance with Section 260526.

- I Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- J Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A See Section 014000 - Quality Requirements, for additional requirements.
- B Inspect and test in accordance with NETA ATS, except Section 4.
- C Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Interior luminaires.
- B Emergency lighting units.
- C Exit signs.
- D Ballasts and drivers.
- E Lamps.
- F LED replacement lamps.
- G For all existing light fixtures to remain or be relocated, the contractor shall clean all lenses, reflectors, trims, etcetera and replace all lamps, drivers and ballasts as required. Coordinate lamp color temperatures with owner and all new lighting and fixtures.

1.02 RELATED REQUIREMENTS

- A Section 260529 - Hangers and Supports for Electrical Systems.
- B Section 260533.16 - Boxes for Electrical Systems.
- C Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D Section 260923 - Lighting Control Devices.
 - 1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
- E Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).
- B IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

- C IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- D NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.
- F NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- H NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- I NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- L UL 1598 - Luminaires; Current Edition, Including All Revisions.
- M UL 1993 - Self-Ballasted Lamps and Lamp Adapters; Current Edition, Including All Revisions.
- N UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - 2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D Field quality control reports.
- E Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- G Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A Comply with requirements of NFPA 70.
- B Substitution for specified lighting fixtures will be considered only after award of contract for a 30 day period.

1. Proposed substitutions will be accompanied by a statement setting forth any variation in contract price, should the substitution be permitted. Each proposed substitution listed will be accompanied by its ETL photometric distribution curve, coefficient of utilization, and other required data. Within seven days after the submittal, the Contractor will be prepared to submit one sample unit of each proposed substitute item accompanied with a sample of the specified item. Samples will include proper lamps, accessories, cord, and plug for operation on 120V. Failure to comply with these requirements will require the Contractor to supply the specified item only.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B Provide 3-year manufacturer warranty for LED luminaires, including drivers.
- C Provide 5-year pro-rata warranty for batteries for emergency lighting units.
- D Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A Furnish products as indicated in luminaire schedule included on the drawings.
- B Substitutions: See Section 016000 - Product Requirements.

2.02 LUMINAIRES

- A Provide products that comply with requirements of NFPA 70.
- B Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C Provide products listed, classified, and labeled as suitable for the purpose intended.
- D Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
 - 1. LED Tape - General Requirements:
 - a. Listed.
 - b. Designed for field cutting in accordance with listing.
 - c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.
- J Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

- A Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - 2. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

- A Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 - 2. Directional Arrows: As indicated or as required for installed location.
- B Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
- C Accessories:
 - 1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.

2. Provide compatible accessory wire guards where indicated.

2.05 DRIVERS

A Drivers - General Requirements:

1. Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
 - a. Wall Dimmers: See Section 262726.
 - b. Daylighting Controls: See Section 260923.

2.06 LAMPS

A Manufacturers:

1. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
2. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B Lamps - General Requirements:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.07 LED REPLACEMENT LAMPS

- A Description: Light-emitting diode (LED) self-ballasted lamps listed as complying with UL 1993; intended for replacement of existing lamps of other light source types, including but not limited to, incandescent, fluorescent, and high intensity discharge (HID); suitable for installation in luminaire to be retrofitted.
- B LED Estimated Useful Life:
 - 1. Calculated based on IES LM-80 test data.
 - 2. Incandescent Lamp Replacements: Minimum of 15,000 hours at 70 percent lumen maintenance.

2.08 ACCESSORIES

- A Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C Provide accessory plaster frames for luminaires recessed in plaster ceilings.
- D Architectural Trims for LED Lighting:
 - 1. Description: Trims designed for integration into architectural elements, with channels to accommodate LED tape lighting system.
- E Fire-Rated Luminaire Enclosures:
 - 1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A Check to see that all lighting fixtures are correct for the project.
- B Coordinate installation of lighting fixtures with mechanical equipment, piping, flexible wiring system, and conduit rough-ins for lighting fixtures.
- C Coordinate all lighting fixtures with ceiling types. Verify ceiling with Architect's drawings and with manufacturer's installation details for ceilings in the area to where fixtures shall be installed before ordering.

- D Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- E Verify that suitable support frames are installed where required.
- F Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- G Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A Provide extension rings to bring outlet boxes flush with finished surface.
- B Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B Perform work in accordance with NECA 1 (general workmanship).
- C Install products in accordance with manufacturer's instructions.
- D Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E Provide required support and attachment in accordance with Section 260529.
- F Provide required seismic controls in accordance with Section 260548.
- G Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- H Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.

5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- I Surface-mounted lifixtures will not have gaps between the fixture and attaching surface, except where required by code regulation. Continuous rows of fixtures shall be installed as to provide perfect alignment.
- J Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
 2. Where light leaks occur, suitable gaskets shall be installed.
 3. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 4. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
 5. Plaster frames furnished by the fixture manufacturer will be provided for all recessed lighting fixtures when installed in plaster or acoustical plaster frame materials, and installation will be included in the bid under this section of the specifications.
- K Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for mounting height specified by Architect.
 2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 3. Install canopies tight to mounting surface.
 4. Unless otherwise indicated, support pendants from swivel hangers.
- L Surface-mounted Luminaires:
1. Lighting fixtures will be supported directly from the building structure and not from the ceiling grid system.

2. Method of support will be in an approved manner with all thread rods, beam clamps, and pipe or Kindorf channel. Wire support and/or caddie clips will not be acceptable.
 3. The support assembly for each fixture will be capable of supporting 150 pounds indefinitely.
- M Install accessories furnished with each luminaire.
- N Bond products and metal accessories to branch circuit equipment grounding conductor.
- O Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- P Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- Q Connect raceways or flexible wiring conductor to lighting fixtures.
- R Install lamps in each luminaire.
- S Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- T For all existing light fixtures to remain or be relocated, the contractor shall clean all lenses, reflectors, trims, etcetera and replace all lamps, drivers and ballasts as required. Coordinate lamp color temperatures with owner and all new lamping and fixtures.

3.04 FIELD QUALITY CONTROL

- A Inspect each product for damage and defects.
- B Operate each luminaire after installation and connection to verify proper operation.
- C Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.
- D Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

- A Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish before final inspection.

3.07 CLOSEOUT ACTIVITIES

- A See Section 017800 - Closeout Submittals, for closeout submittals.
- B See Section 017900 - Demonstration and Training, for additional requirements.
- C Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

- A Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 310001 – EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing sub-grades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings, site amenities and structures.
3. Drainage course for slabs-on-grade.
4. Sub-base course for concrete walks and pavements.
5. Base course for asphalt paving.
6. Dense graded aggregate surface courses
7. Subsurface drainage backfill for trenches.
8. Excavating and backfilling trenches within building lines.
9. Excavating and backfilling trenches for buried drains, mechanical and electrical utilities and pits for buried utility structures.
10. Gravel at existing turf pavers

B. Related Sections include the following:

1. Section 311001 - Site Clearing for site stripping, grubbing, removing topsoil and protecting trees to remain.
2. Section 321201 – Hot Mix Asphalt Paving for surface pavement on site.
3. Section 329000 - Planting, Seeding & Sodding for finish grading, including placing and preparing topsoil for lawns and plantings.
4. Section 321601 - Site Concrete Work
5. Section 313001 - Soil Erosion and Sediment Control

1.2 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the sub-base course and asphalt paving.

- C. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above sub-grade elevations.
 - 1. Additional Excavation: Excavation below sub-grade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
 - 3. Unauthorized Excavation: Excavation below sub-grade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, piers, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Sub-base Course: Layer placed between the sub-grade and base course for asphalt paving, or layer placed between the sub-grade and a concrete pavement or walk.
- J. Sub-grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- L. Triax Geotextile: Tensar Triax TX140 or an approved equal.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Drainage fabric.
 - 3. Separation fabric.
- B. Samples: For the following:
 - 1. 30-lb (14-kg) samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
 - 2. 12-by-12-inch (300-by-300-mm) sample of drainage fabric.
 - 3. 12-by-12-inch (300-by-300-mm) sample of separation fabric.

- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
 - 3. Soil class rating tests for soil replacement material to be placed in bottom of the onsite septic system disposal bed in accordance with the approved onsite septic plan and as directed by the Engineer.

1.4 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: The contractor shall hire an independent testing agency qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Landscape Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner written permission.
 - 3. Existing utilities may not be as shown on the drawings.
 - 4. Contact utility-locator service for area where Project is located before excavating.
- B. It is the responsibility of the Contractor to verify the existing site and subsurface conditions prior to proceeding and while progressing with the work. If such conditions are found to deviate from those presented, he shall immediately notify the Owner's Representative and shall not proceed further until direction is given.
- C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Provide certifications that borrow materials are from virgin sources and/or have been sampled per NJDEP guidelines to meet the NJDEP Residential Direct Contact Soil Remediation Standards or as required by local code.
- B. Protection: Protect sub-grades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

- C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- E. Backfill and Fill: Satisfactory soil materials approved in advance by the Engineer of record.
- F. Sub-base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- I. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- J. Drainage Course/Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.
- K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- M. Granular bedding material: Narrowly graded mixture of natural or crushed sand with 100 percent passing the 3/8-inch sieve.
- N. Dense Graded Aggregate: As specified in (NJDOT) NJ Department of Transportation Standard Specifications for Road and Bridge Construction (2019) Section 901.10.01. Exposed dense graded aggregate shall be virgin dense graded aggregate. Recycled concrete aggregate (RCA) is not permitted on this project without express written consent by the Owner and Engineer, and any realized cost savings for utilization of RCA shall be made payable for the Owner's benefit.
- O. Top Soil: Refer to Section 329000 "Planting, Seeding & Sodding" for specifications for topsoil. Section 329000 specifications also apply to borrow topsoil required to complete the project.
- P. No. 7 Stone: As specified in (NJDOT) NJ Department of Transportation Standard Specifications for Road and Bridge Construction (2007)

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as indicated in subsection "B" below.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying non-ferrous underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems and plastic roof drains.
- C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
 - 2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
 - 3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
 - 4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.
- D. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 - 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.
- E. Geogrid: Tensar Triax TX140 or an approved equal.
- F. Erosion Control Blanket: Erosion control blanket shall be ECS-2B as manufactured by East Coast Erosion Control or an approved equal. The Erosion Control Blanket shall be made with uniformly distributed 100% agricultural straw and two organic jute nets securely sewn together with biodegradable thread. The tightly compressed blankets shall be wrapped and include a product label, code and installation guide. The blankets shall be palletized for easy transportation. The Erosion Control Blanket has functional longevity of approximately 12 months, and shall be suitable

for slopes 3:1 to 2:1 and low to medium flow channels. The Erosion Control Blanket meets Type 2.D specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17.

<u>Index Value Properties</u>			
Property	Test Method	Typical	
Mass/ Unit Area	ASTM D6475	9.00 oz/yd ²	305.1 g/m ²
Thickness	ASTM D6525	.3 in	7.62 mm
Tensile strength-MD	ASTM D6818	190 lb/ft	2.77 kN/m
Elongation-MD	ASTM D6819	16%	
Tensile strength-TD	ASTM D6820	130 lb/ft	1.90 kN/m
Elongation-TD	ASTM D6821	16.8%	
Light Penetration	ASTM D567	20%	
Density/ Specific Gravity	ASTM D792	N/A g/cm ³	
Water Absorption	ASTM D1117	510%	

Channel Performance Design Values*

Property	Test Method	Value	
Unvegetated Shear Stress	ASTM D 6460	1.75 lbs/ft ³	83.79 Pa
	ASTM D 6460		
Unvegetated Velocity	6460	6.0 ft/s	1.83 m/s

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect sub-grades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.
- B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Re-route or direct surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep sub-grades dry and convey ground water away from excavations. Maintain until dewatering is no longer required. Dewatering system is not to discharge directly into existing watercourse or detention basin or perforated under drains or roof drains. At completion of dewatering, flush any accumulated sediment from storm drains. Dewatering operations and methods shall be in conformance with the Standards for Soil Erosion and Sediment Control in New Jersey and as directed by the Landscape Architect/Engineer or County Soil Conservation District.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to sub-grade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Classified Excavation: Excavation to sub-grade elevations classified as earth and rock. Rock excavation will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.
 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified, as rock excavation is earth excavation.
 2. Rock excavation includes removal and disposal of rock.
 - a. Do not excavate rock until it has been classified and cross-sectioned by Landscape Architect/Engineer.

3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations from 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Drainage Structures, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) on each side of pipe or conduit or as indicated on drawings.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape sub-grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench sub-grade.
 - 1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed sub-grade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
 - 4. Special bedding for plastic piping required and is detailed on the drawings or as recommended by manufacturer.

3.7 APPROVAL OF SUBGRADE

- A. Notify Engineer when excavations have reached required sub-grade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll sub-grade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated sub-grades.
- D. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when required by Engineer.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrows materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. Provide slit fence around the base of all stockpiles.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for plastic piping or conduit less than 24 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway sub-base.
- D. Place and compact initial backfill of sub-base material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- G. Place and compact final backfill of satisfactory soil material to final sub-grade.

- H. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below sub-grade under pavements and slabs.

3.12 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.13 MOISTURE CONTROL

- A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, retaining walls and pavements, scarify and recompact top 12 inches (300 mm) of existing sub-grade and each layer of backfill or fill material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below sub-grade and compact each layer of backfill or fill material at 92 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below sub-grade and compact each layer of backfill or fill material at 85 percent.

3.15 GRADING

- A. General: 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.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings 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).
- C. 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.

3.16 SUBBASE AND BASE COURSES

- A. Install and Compact as Follows:
 - 1. Place base course material over geogrid (where applicable) and sub-base.
 - 2. Compact sub-base and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
 - 3. Shape sub-base and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted sub-base or base course is 6 inches (150 mm) or less, place materials in a single layer.
 - 5. When thickness of compacted sub-base or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.
- B. Pavement Shoulders: Place shoulders along edges of sub-base and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each sub-base and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 DRAINAGE COURSE/DRAINAGE FILL

- A. Under slabs-on-grade and behind retaining walls, place drainage course on prepared sub-grade and compact as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches (150 mm) or less, place materials in a single layer.

3. When compacted thickness of drainage course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.
- B. Surrounding perforated pipe, place drainage fill over geotextile drainage fabric in prepared trench, surrounding pipe as indicated on drawings.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor shall engage an independent agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.
- C. Footing Sub-grade: At footing sub-grades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of sub-grade with tested sub-grade when approved by the Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.
- E. When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. 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.
 1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Owner or Engineer.
 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

3.21 Stone at Turf Pavers

- A. Remove existing vegetation and soil materials from existing turf pavers where indicated.
- B. Fill all voids solid with No.7 stone and compact.

PART 4 - PAYMENT

4.1 Earthwork

- A. Quantity: The quantity for which payment will be made is the lump sum price for all earth excavation, trenching, grading, backfilling, dewatering, shoring and bracing and all other related work as shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item Earthwork, which price shall include the cost required for all activities described herein, including cuts/fills, imports and exports of materials, miscellaneous trenching and conduit installation, all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.2 Dense Graded Aggregate 4" Thick

- A. Quantity: The quantity for which payment will be made is the square yard price for providing; placing and compacting a 4 inch thick dense graded aggregate base course at the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the square yard price in the Proposal for the Item Dense Graded Aggregate - 4" Thick, which price shall include the cost required for all activities described herein, including providing, placing and compacting materials, , all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.3 Dense Graded Aggregate Base Courses

- A. The cost for the dense graded aggregate base course for various types of pavements shall be included in the unit price of the various items constructed with Dense Graded Aggregate Base Courses.

4.4 Stone at Turf Pavers

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- A. Quantity: The quantity for which payment will be made is the square yard price for removing existing soil materials, providing, placing and compacting a No. 7 surface course at the existing Turf Paver locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the square yard price in the Proposal for the Item Stone at Turf Pavers, which price shall include the cost required for all activities described herein, including removing existing soils from pavers, providing, placing and compacting, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 310001 EARTHWORK

SECTION 311001 – SITE CLEARING/DEMOLITION

PART I – GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing trees and vegetation to remain.
 - 2. Removing trees and other vegetation.
 - 3. Clearing, grubbing and demolition.
 - 4. Topsoil stripping, stockpiling and resspreading
 - 5. Demolition and Removal of existing above-and below-grade site improvements.
- B. Related Sections include the following:
 - 1. Section 310001 - Earthwork for soil materials, excavating, backfilling, and site grading.
 - 2. Section 313001 - Soil Erosion and Sediment Control
 - 3. Section 329000 – Planting, Seeding & Sodding for finish grading, including placing and preparing topsoil for lawns and plantings.
 - 4. Section 013599 – Traffic Signs for temporary traffic control devices and measures.

1.02 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.03 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.04 SUBMITTALS

- A. Photographs or videotape, dated with description, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Division I Section "Contract Closeout."
 - 1. Identify and accurately located capped utilities and other subsurface structural, electrical, and mechanical conditions.

- C. Contractor to submit details and layout for temporary construction fencing and gates. Submittal to be approved, in writing, by the Landscape Architect prior to the installation of temporary fencing and gates.

1.05 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section as applicable.

1.06 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities during site-clearing operations.
- B. Salvable Improvements: Carefully and promptly remove items indicated to be salvaged and surrender to Owner.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 310001 - Earthwork.
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.02 FENCING

- A. Tree protection fencing shall be as shown on the approved Soil Erosion and Sediment Control Plan or as directed by the Landscape Architect.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition.

3.02 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-time spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 1. Cover exposed roots with burlap and water regularly.
 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Landscape Architect.
 1. Employ an arborist to submit details of proposed repairs and to repair damage to trees and shrubs.
 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the arborist.

3.03 UTILITIES

- A. Locate proposed underground electrical service. All work to be coordinated with the local utility company, the County and Landscape Architect.
 1. Contractor to provide all material, equipment and labor necessary to locate the electrical service as shown on the plans or as directed by the Landscape Architect.
 2. Electrical lines shall be installed in accordance with the requirements and specifications of the local utility company.
 3. The Contractor shall pay for all work required to be performed to connect work by others to the proposed restroom building as necessary to complete electrical service to the proposed building.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.04 CLEARING, GRUBBING AND DEMOLITION

A. Remove obstructions, trees, shrubs, grass and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Completely remove stumps, roots, obstructions, structures, and debris extending to a depth of 12-inches below exposed sub-grade, otherwise 24-inches below footings, curbs and pavements.

4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 6-inches loose depth, and compact each layer to 95% of the modified proctor maximum density.

3.05 TOPSOIL STRIPPING, STOCKPILING AND RESPREADING

A. Remove vegetation before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. **Presence of onsite topsoil is limited.**

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Do not stockpile topsoil within drip line of remaining trees.

2. Reuse topsoil on site for landscaped and lawn areas to depths specified.

3. Dispose of excess topsoil as directed by owner.

4. Install silt fence around the base of stockpiles as shown on the approved Soil Erosion and Sediment Control Plan.

D. Respread topsoil to the depths indicated on the construction documents or as directed by the Landscape Architect. Refer to "Earthwork" and "Planting, Seeding & Sodding" sections for additional requirements.

3.06 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, foundations and aggregate base courses as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
- C. Remove and relocate or reinstall various items as indicated.

3.07 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property unless otherwise directed to relocate on Owner's property.

PART 4 - PAYMENT

4.01 Site Clearing/Demolition

- A. Quantity: The quantity for which payment will be made is the lump sum price for all work as described above, including removal and reinstallation (when indicated) and shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item Site Clearing/Demolition, which price shall include the cost required for all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 311001 SITE CLEARING/DEMOLITION

SECTION 313001 – SOIL EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The contractor shall supply all labor, tools, equipment, materials and services necessary to install the soil erosion and sedimentation control devices shown on the drawings, to perform their continued repair and maintenance during construction, and remove all devices and make necessary repairs upon completion of work. See drawings for construction sequence.

1.01 RELATED SECTIONS

- A. Section 310001 – Earthwork
- B. Section 311001 – Site Clearing

1.02 REGULATIONS

- A. A copy of the certified plans indicating soil erosion and sediment control measures shall be available on site at all times during construction.
- B. No grading shall occur until required permits have been issued. All soil erosion and sediment control devices shall be in place prior to the start of any type of earth moving activities, clearing or disturbance on the site.

PART 2 – PRODUCTS

2.01 SILT FENCE

- A. Silt fence to be minimum 36-inches wide filter fabric manufactured for this use. Materials for the installation of the silt fence shall be as specified on the approved Soil Erosion and Sediment Control Plan or as directed by the Engineer or County Soil Conservation District.

2.02 RIPRAP

- A. Riprap for stone tracking pads, riprap aprons and at the ends of storm sewer piping shall be a uniformly graded mixture of rock conforming to the requirements of the NJDOT Standard Specifications for Road and Bridge Construction, latest edition. The size and location for the placement of riprap shall be as specified on the approved Soil Erosion and Sediment Control Plan, the project plans or as directed by the Engineer or County Soil Conservation District.

2.03 SEEDING

- A. Temporary seed mixture shall be as specified on the approved Soil Erosion and Sediment Control Plan or as directed by the Engineer or County Soil Conservation District.
- C. Permanent seeding shall be as specified in Section 329000 – Planting, Seeding & Sodding.

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2.04 TURF REINFORCEMENT MAT

- A. Turf reinforcement mat shall be ECP-2 Polypropylene Turf Reinforcement Mat as manufactured by East Coast Erosion Control or an approved equal.

2.05 FLOATING TURBIDITY BARRIER

- A. Floating turbidity barrier shall be as specified in Section 919.13 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.

2.06 SEDIMENT CONTROL BAG

- A. Sediment control bags shall be as specified in Section 919.02 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, current edition.

PART 3 – EXECUTION

3.01 CONSTRUCTION PLANNING

- A. Planning and coordination of the construction is needed to reduce sediment pollution. Accurate planning shall be used to minimize the area of disturbance. Clearing shall be kept to the shortest practical distance ahead of construction. Cleared areas shall be kept to a minimum to facilitate the construction. Install devices prior to and in accordance with the stages of construction.

3.02 SEDIMENT CONTROL

- A. The silt fence and construction entrance shall be constructed and installed as detailed on the plans.
- B. Construct and/or install any additional devices as directed by the Engineer or County Soil Conservation District.
- C. The floating turbidity barrier shall be installed if and where directed by the Engineer or County Soil Conservation District.

3.03 EROSION CONTROL

- A. Stabilize disturbed areas with temporary or permanent seeding as necessary and immediately after disturbance, when said areas are either completed or will not be worked on for a period exceeding 30 days.
- B. Practice good earthwork procedures to limit erosion of graded areas. Work should be conducted during appropriate weather conditions and coordinated so that seeding operations can immediately commence. Finish tracks of grading equipment should run parallel.
- C. Soil erosion and sediment control measures shall be provided and maintained in accordance with the approved Soil Erosion and Sediment Control Plan and as directed by the Engineer or County Soil Conservation District.

3.04 MAINTENANCE AND REPAIRS

- A. Sediment and erosion control practices will not function properly throughout their designed life span if they are not maintained. Periodic inspection shall be made after

each storm to detect any impairment in the ability of the erosion control facilities to function effectively. Responsibility for maintenance shall be by the contractor and shall be assigned to an individual who has access to equipment, material and funds required to sustain the maintenance schedule.

- B. Most storm structures require work to restore them after each storm. Accumulated silt shall be spread over areas disturbed by construction in this project. This maintenance shall be performed to allow the structure to continue to perform, the function for which it was designed, and includes;

1. Repairs to broken silt fence. Removal of accumulated silt behind silt fencing, for spreading in other disturbed areas.
2. Seeding as required as a result of maintenance.
3. Cleaning and/or replacement of riprap that becomes filled with silt.

3.05 DEVICE REMOVALS

- A. The contractor shall remove all temporary soil erosion and sediment control devices after uphill areas are stabilized. The contractor shall exercise care in removal of the devices, and will be responsible for the repair of damage created as a result of removing devices.

PART 4 - PAYMENT

4.01 SOIL EROSION AND SEDIMENT CONTROL

- A. Quantity: The quantity for which payment will be made is for all work as described above and shown on the plans or as directed by the Landscape Architect, Engineer or County Soil Conservation District.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item Soil Erosion and Sediment Control, which price shall include the cost required for all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 313001 SOIL EROSION AND SEDIMENT CONTROL

SECTION 313002 – WATER

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The contractor shall provide all labor, all pipe, fittings, valves, gaskets, bolts, nuts, polyethylene encasement, and other materials, equipment, special services and all else necessary to furnish, install, flush, test, and disinfect all buried water lines on the site as required by the plans and Specifications to fulfill the intent of same. Excavation, bedding, backfill, and disposal of excess material shall conform to Section 207.
- B. The contractor shall provide all labor, materials, and equipment necessary to construct new water services or relocate existing water services at the locations indicated on the plan or as directed by the engineer and as detailed in the applicable sections of these specifications. The contractor shall furnish all necessary adapters, connections, and fittings to connect new or relocated services to the existing building services.

PART 2 – MATERIALS

2.01 JOINTS

- A. All main pipe joints shall be the "Push-on" type with rubber gasket conforming to ANSI A21.11 (AWWA C-111) or of the mechanical joint type. Mechanical joints will be required when connecting to existing mains. Pipe plain ends shall be suitably beveled to permit easy entry into the bell. EACH JOINT SHALL BE PROVIDED WITH TWO BRONZE WEDGES SECURELY DRIVEN BETWEEN THE OUTSIDE OF PIPE AND INSIDE OF BELL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS IN ORDER TO PROVIDE ELECTRICAL CONTINUITY.

2.02 FITTINGS (UNDERGROUND)

- A. All water main fittings shall be cast iron or ductile iron fittings with cement lining, interior bituminous seal coat and standard exterior coal tar dip coating. Cast and ductile iron fittings shall conform to ANSI 21.10. Mechanical joints and push-on joints shall conform with ANSI 21.11. All mechanical joint fittings and push-on joint fittings shall be installed strictly in accordance with both the pipe and fitting manufacturer's recommendations specifically with regard to permissible torque of bolts and the effective sealing of the joint. If effective sealing is not attained at the maximum recommended torque the joint shall be disassembled and reassembled after thorough cleaning and if necessary with a new gasket. Overstressing the torque of bolts to compensate for poor installation procedures will not be permitted.

2.03 GATE VALVES (UNDERGROUND)

- A. Gate valves shall conform with all applicable provisions of standard Specification AWWA C-509-87 (as amended) for Resilient Seal Wedge Gate Valves. Buried gate valves shall be iron body, inside manganese bronze mounted disk parallel seat and "O" ring seals. The interior of the valve and gate shall be coated with a synthetic rubber or epoxy compound to provide a durable gate seating surface and protection against abrasion, tuberculation, scale, etc. The valve shall have a fullbore, unobstructed flow path for full flow capacity. All valves shall open counter clockwise, shall be set plumb, and shall be furnished with a 2-inch square operating nut. Valves shall be of the non-rising stem type and shall be as manufactured by U.S. Pipe Co., Kennedy Valve Co., Mueller Co., or approved equal.

- B. All valves up to 12" diameter shall be supplied with mechanical joint ends, shall be suitable for working pressures to 200 PSI and shall be installed in the vertical position. Valves larger than 12" diameter shall be suitable for working pressures to 150 psi, shall be installed in the horizontal position and shall be provided with bevel gear operator and enclosed grease case. All valves larger than 12" diameter shall also be provided with a 3-inch bypass valve (with separate valve box) and rollers, horizontal tracks and scrapers. Lubrication instructions and parts lists shall be furnished in triplicate for each type of valve provided. No valves shall be ordered without first obtaining the approval of the manufacturers and style from the Engineer.

2.04 VALVE BOXES

- A. All buried valve boxes shall be 2 piece sliding type cast iron valve boxes. Where valves are deeper than 4'-0" extension stems shall be provided to within 2'-0" of the ground. All extension stems shall be of heavy-duty construction, shall be coated with 2 coats of asphaltum varnish, and shall be provided with a self-centering ring to maintain the stem in the center of the valve box. Each valve box shall be Catalog Figure 120 as manufactured by Kennedy, Mueller Company Catalog No. H-10364 or approved equal.
- B. All valves boxes and extension stems shall be set plumb. All valve box covers shall have the word "water" and an arrow indicating the direction of valve opening cast on. Concrete block shall be poured around all valve boxes not set in paved area as shown on the detail sheet.
- C. After completion of the project, the contractor shall furnish the owner with two (2) adjustable valve wrenches suitable for operating all valves.

2.05 WATER SERVICE CONNECTIONS AND RELOCATIONS

- A. Pipe: Copper piping for underground service shall be Type "K" soft annealed seamless copper water tube, ASTM B88 72, with approved brass flared joint fittings.
- B. Service Fittings: All service fittings shall be forged of waterworks bronze alloy and be as manufactured by the Mueller Company or approved equal.

Corporation Stops: Mueller 15000

Curb Stop: Mueller No. 15204

Curb Box: Mueller cast iron extension type with arch pattern base

Connectors: Mueller 110 flared type

PART 3 – PIPE INSTALLATION

3.01 WET TAPS INSTALLATION

- A. Where shown on the drawings or as required by the specifications, the contractor shall connect to existing water mains under system pressure utilizing tapping sleeves, valves and a water main drilling machine. Prior to ordering the sleeves, the contractor shall be responsible for determining the size and material of the water main to be connected to.
- B. The tapping sleeves shall be of the split sleeve bolt-on type with mechanical joint end connections. The mechanical joint connections shall be provided with totally confined end duck tipped gaskets to resist cold flow and creep. The sleeves shall be

rated for working pressure of 200 psi. Prior to placing the sleeve onto the main to be drilled, the main shall be thoroughly cleaned down to the original pipe material in order to insure the water and pressure tight fit of the sleeve. The tapping sleeve shall be Mueller Company Model H-615 for sleeve less than 10" diameter and H-616 for sleeves 10" and larger, Kennedy Square Seal, U.S. Pipe, Smith Dual Compression Seal, or approved equal.

- C. Where shown on the drawings, tapping sleeves shall be compatible for use with the material of the existing water mains.
- D. The tapping valve shall be a non-rising stem gate valve, as described in a previous section of the Specification. The tapping valve shall have flanged to mechanical joint end connections. Valves shall comply with AWWA C509-87 (as amended) for resilient seal wedge gate valves. The water main tapping shall be made by a drilling machine specifically designed for water main connections under pressure. Upon the attachment of the tapping sleeve and valve and drilling machine to the main, the entire assembly shall be pressure tested in accordance with Subsection 651.03.01.F prior to making the cut. The drilling machine shall be air or gasoline motor operated. The use of manually operated machines will not be permitted. The drilling machine shall be equipped with a tungsten-carbide tipped shell cutter and pilot drill.
- E. The contractor shall provide competent and qualified personnel, completely familiar with the operation of the drilling machine, and thoroughly familiar with the operation of tapping water mains under pressure.
- F. A concrete slab shall be poured under the body of the tapping valve AFTER the completion of the tapping operation in such a manner that will not affect any future work on the joints or of valve parts.
- G. All equipment and materials shall be sterilized before installation.

3.02 OPEN TRENCH METHOD

- A. Pipe laying shall start at the low end unless otherwise approved by the Engineer. Excavation for the pipeline will conform to the lines and grades shown on the drawing. The width of the trench at the point six inches above the top of the pipe will be no more than two feet plus the diameter of the pipe. The width of the trench at the ground surface may vary depending on the depth of the excavation and character of material, but shall be kept to a minimum.
- B. The pipe shall be bedded and covered with suitable granular material as shown on the construction detail drawings.
- C. Each section of pipe will be laid so that it is in contact with the bedding material for its full length. Recesses will be excavated for couplings. Pipe will not be supported by couplings, blocks, bricks, or similar devices.
- D. Cutting of pipe sections shall be done only by experienced men using methods recommended by the manufacturer in a manner that will result in a smooth end normal to the axis of the pipe.
- E. Prior to connecting pipe sections all plain ends shall be beveled in accordance with the manufacturer's recommendations.
- F. Pipe shall be laid to the grade shown on the contract drawings and shall have a minimum cover of 4.0 feet. The contractor shall take all necessary precautions to ensure that the pipeline is laid at a continuous grade upward from low points to high

points in order to ensure that intermittent high points are not created which would require the installation of additional means of air release.

3.03 WATER SERVICE INSTALLATION

- A. The contractor shall install building water services in the location shown on the contract drawings or as directed by the engineer. Materials required for said installation will be as described in other applicable sections of this specification. Water services shall be installed by method of open cutting the existing roadway and shall be performed in accordance with the approval of the engineer. Upon completion of said crossing, the contractor will proceed to install the service fittings as previously described and shown in detail on the contract drawings. The water main and service fittings shall be thoroughly tested as described in other applicable sections of these specifications prior to connection to existing building or dwelling water services.
- B. Where existing services to be relocated are behind existing sidewalks or curbs, or embedded in existing sidewalks or driveway aprons, the contractor shall relocate such existing water services, where directed and restore any disturbed area to its original condition in a manner approved by the engineer.

PART 4 - PAYMENT

4.01 WATER SERVICE

- A. Quantity: The quantity for which payment will be made is for all work as described above and shown on the plans or as directed by the engineer.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item WATER SERVICE, which price shall include the cost required for all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 313002 WATER

SECTION 313003 – SANITARY SEWER

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The contractor shall provide all labor, all pipe, fittings, gaskets, manholes, castings, special connections and other materials, equipment, special services, and all else necessary to furnish, install, flush, and test all sanitary sewer lines as required by the plans and specifications, or as required in order to fulfill the intent of the same. Requirements for excavation and backfill shall be in accordance with Section 311001.
- B. If pumping and bypassing is required, the contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the section of pipe under construction. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm. The contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. Pump engines shall be equipped in a manner to keep noise to a minimum.
- C. When flow in a sewer line is plugged, blocked, or bypassed, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.
- D. The contractor is advised that the existing utilities shown on the plans are approximate and work under this section shall include the location of same by the contractor, including existing service connections.
- E. Connection of existing active laterals shall be in accordance with this Section. The contractor shall attempt to contact each homeowner and/or business which may be affected by the sanitary sewer construction at least 48 hours prior to the start of same. The contractor at that time, shall attempt to arrange access into the home or business during the sewer main installation in order to perform a dye test to determine which laterals are active. The dye used for this test shall be yellow/green liquid powder tracing dye as manufactured by Norlad, or equal. In lieu of a dye test, televising or other means to determine the location of active laterals as may be approved by the Engineer shall be acceptable.
- F. Each active lateral shall be connected to the new main as work progresses in accordance with Section 652. Any existing laterals which tie directly into a manhole shall be connected to the new sewer main with a standard wye connection. The contractor shall verify, prior to the end of each working day, that all homes and/or businesses located along the new sanitary main installation have been connected. If it is determined that an active lateral has not been connected, the contractor shall immediately provide all labor, material, equipment and all else necessary to connect same.
- G. All existing laterals determined to be inactive shall be cut at the edge of the trench wall and plugged in accordance with Section 311001.

PART 2 – MATERIALS

2.01 POLYVINYL CHLORIDE PIPE

- A. All pipe shall be best quality unplasticized polyvinyl chloride sewer pipe, adequate for the external loading conditions shown on the plans, with joints providing flexibility and water tightness under service conditions. Smooth internal surfaces, producing high carrying capacity obtainable with best standard practice and best workmanship, will be required. Pipe shall be in accordance with ASTM Specification D3034 (latest edition) and shall meet the requirements for extra strength minimum of the SDR 35 section of the above noted ASTM Specification.
- B. The pipe shall be accurate and of uniform dimensions. All pipe shall be straight and true to form without bulges, dents, cracks, tears, or other defects which will affect strength, and shall have no bulges or dents on interior surfaces which will result in a noticeable variation in diameter from that obtained on adjacent unaffected portions of the surface. Each pipe shall not vary in length more than 1.0 inch in a length of 12 1/2 feet measured as mid ordinate. Materials' properties shall meet the test requirements of ASTM D1784 (latest edition).
- C. Joints shall be of the bell and spigot type with rubber ring. The bell shall consist of an integral wall section with a solid cross section rubber ring factory assembled. The ring groove shall be so designed as to prevent ring displacement. Sizes shall be as shown on the contract drawings or as required by field conditions. Jointing shall be in strict accordance with the recommendations of the pipe manufacturer.
- D. All fittings shall be PVC sewer pipe fittings with a rubber ring in each bell and ring groove so designed as to prevent ring displacement. All connections shall be made as shown on the drawings or herein specified. Branch connections and service connections for PVC sewer pipe shall be such as to meet ASTM Standards as specified in ASTM D3034 73 SDR 35 (latest edition) or ASTM F679 80 as applicable. All associated pipe shall be PVC gravity sewer pipe as specified in the pipe material specification herein.

2.02 BACKFILLING

- A. Individual house service connections shall be required where active laterals exist along the proposed sewer main. Said house service connections shall be installed in accordance with the details set forth on the contract drawings. The minimum size of each individual service shall be 4", and all new lateral connections shall be the same diameter as the existing laterals.
- B. A wye connection will be required to connect the proposed service connection to the proposed sewer main. The depth of the sewer lateral shall be as directed by the Engineer and in accordance with the contract drawings and applicable detail. A cleanout shall also be installed at the location directed by the Engineer and in accordance with the contract drawings. The cleanout shall be surrounded with a one (1) foot by one (1) foot concrete marker and topped with a brass cap in accordance with the contract drawings.
- C. Service connections in any given street shall be laid coincidentally with the main sewer installation so that street repairs and cleanup are rapidly completed, and each existing lateral shall be connected to the new service connection at this time. All laterals and cleanouts shall be PVC pipe, except DIP laterals and cast iron cleanouts shall be used when connecting to a DIP sewer main.
- D. The house service connection shall be connected to the existing lateral by means of a coupling as manufactured by Fernco, or approved equal, as directed by the Engineer.

- E. The contractor is herein advised that vertical and/or sloped lateral risers may be required where existing risers are encountered, and at other locations as directed by the Engineer. Construction of same shall be in accordance with applicable sections of these specifications and the construction details.
- F. The pipe shall be laid on a continuous upgrade of not less than 1/4" per foot and located where ordered by the Engineer.
- G. The proposed house service connection shall be tested to the terminus of the connection by means of an exfiltration test as detailed in other applicable sections of these specifications.
- H. The contractor shall utilize blow up plugs or other methods as may be approved by the Engineer, in order to isolate the new service connection from the existing house lateral such that the tests can accurately be performed.

PART 3 - PAYMENT

3.01 SANITARY SEWER

- A. Quantity: The quantity for which payment will be made is for all work as described above and shown on the plans or as directed by the engineer.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item SANITARY SEWER, which price shall include the cost required for all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 313003 SANITARY SEWER

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil treatment.
 - 2. Bait-station system.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
 - 2. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of termite control product.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.
- D. Bait-Station System Installation Report: After installation of bait-station system is completed, submit report for Owner's records and include the following:
 - 1. Location of areas and sites conducive to termite feeding and activity.

2. Plan drawing showing number and locations of bait stations.
3. Dated report for each monitoring and inspection occurrence, indicating level of termite activity, procedure, and treatment applied before time of Substantial Completion.
4. Termiticide brand name and manufacturer.
5. Quantities of termiticide and nontoxic termite bait used.
6. Schedule of inspections for one year from date of Substantial Completion.

E. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who is accredited by manufacturer.

1.6 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Termidor SC.
 - b. Bayer Environmental Science; Premise 75 WP.
 - c. Ensysstex, Inc; Maxxthor SC.
 - d. FMC Corporation, Agricultural Products Group; Dragnet SFR.
 - e. Syngenta; Demon Max.
 - 2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.

2.3 BAIT-STATION SYSTEM

- A. Description: EPA-Registered system acceptable to authorities having jurisdiction. Provide bait stations based on the dimensions of building perimeter indicated on Drawings, according to product's EPA-Registered Label and manufacturer's written instructions.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Advance Termite Bait System.
 - b. Ensysstex, Inc; Exterra.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

- 1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

- 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
 - 3. Masonry: Treat voids.
 - 4. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

- B. Post warning signs in areas of application.

- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 INSTALLING BAIT-STATION SYSTEM

- A. Bait-Station System: Install after construction, including landscaping, is completed.

- B. Place bait stations according to product's EPA-Registered Label and manufacturer's written instructions, in the following locations:

- 1. Conducive sites.
 - 2. In and around infested trees and stumps.
 - 3. In mulch beds.
 - 4. Where wood directly contacts soil.
 - 5. Areas of high soil moisture.
 - 6. Near irrigation sprinkler heads.
 - 7. Each area where roof drainage system, including downspouts and scuppers, drains to

- soil.
 - 8. Along driplines of roof overhangs without gutters.
 - 9. Where condensate lines from mechanical equipment drip or drain to soil.
 - 10. At plumbing penetrations through ground-supported slabs.
 - 11. Other sites and locations as determined by licensed Installer.
- C. Spacing: Place bait stations according to manufacturer's written instructions and at a frequency no less than the following:
- 1. One bait station per 20 linear feet.

3.5 PROTECTION

- A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.6 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include quarterly maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 - 1. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION 313116

SECTION 321413 UNIT PAVEMENTS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF 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. Brick Paving

1.03 RELATED SECTIONS

- A. Earthwork
- B. Site Concrete
- C. Cast in Place Concrete- For Concrete Base

1.04 SUBMITTALS

- A. Certification
 - 1. General
 - a. Certificates of inspection as required by governmental authorities.
 - b. Other data substantiating that the 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 Landscape 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.

1.05 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 Landscape Architect for consideration. If he does so, he must include price clarification for such substitutions. **Any substitution must be approved in writing by the Landscape Architect.**

1.06 QUALITY ASSURANCE

- A. Work under this item must be done by a single firm specializing in the work.

1.07 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.
- 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete work under this item as rapidly as portions of the site become available.
- B. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- C. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- D. Do not install unit pavements until after all utility lines, backfilling and grading has been completed.
- E. Clean-up and Protection
 - 1. During unit pavements work keep pavements clean and work area in an orderly condition.
 - 2. Protect unit pavements work and materials from damage due to operations by other contractors, trades and trespassers.
 - 3. Repair or replace damaged materials as directed by the Landscape Architect.

1.09 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.
- B. Unit pavements may be inspected for acceptance in parts agreeable to the

Landscape Architect, provided work offered for inspection is complete.

- C. When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

1.10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than one (1) year from the date of final acceptance by the Landscape Architect.

PART 2 – PRODUCTS

2.01 BRICK PAVERS

- A. All brick pavers shall be “Rumbled”, Color: Full Range, with standard finish as manufactured by Pine Hall Brick, or approved equal to match existing adjacent brick paving. The sizes, colors and patterns shall be as shown on the plans, and as approved by the landscape architect. Materials shall be as specified by the manufacturer and are incorporated herein by reference. Submit sample for review.

The base and sub-base materials shall be as shown on the Plans, and shall conform to the materials as shown on the engineers drawings for the respective items, and as specified by the manufacturer. Concrete base shall conform with project specifications. Sand setting bed materials shall comply with the Brick Industry Association specifications and be ASTM C33. Mason sand, stone dust or screenings are not acceptable.

The edge restraint shall be Structure Edge, as manufactured by Permaloc, Inc., or approved equal. Submit sample for review.

Jointing sand shall be Gator Super Polymeric Sand, color; beige, as manufactured by Alliance Group, and supplied by Church Brick (609) 298-0090 or approved equal. Submit sample for review and approval.

PART 3 – EXECUTION

3.01 BRICK PAVERS

- A. The location of brick pavers shall be as shown on the drawings. The aggregate base course, concrete base course, sand setting bed, brick pavers, edge restraint, and joint sand shall be installed as shown on the drawings in strict accordance with the manufacturer’s specifications.
- B. Sand setting beds for brick pavers shall not be compacted prior to setting of pavers.
- C. Edge restraint shall be provided in all areas where pavers are adjacent to lawn, loose stone, or planting beds.
- D. No plate tampers or any other compactor shall be used on top of the pavers without proper precautions being in place to protect finish surfaces from scuffing or damage. All adjustments to pavers shall be made by hand or rubber mallet.

- E. Repeat joint sanding operations until joints are completed filled.
- F. When fully installed, decorative pavers shall be firmly imbedded and secure. It shall be flush and meet smoothly and evenly with adjacent pavements and/or grade. Decorative pavement shall be free of any marks, holes, etc., as a result of transportation to the site and construction.
- F. All joints shall be aligned as shown on the plans, as approved in the field by the landscape architect. Mitered cuts may be required in radial patterns to maintain joint widths. No fractional cuts shall be made on corner pieces, and multiple cuts may be required to maintain relative proportions of units as directed by the landscape architect.

PART 4 PAYMENT

4.01 BRICK PAVERS

- A. Quantity: The quantity for which payment will be made will be the area of the various brick pavers actually constructed as specified, as measured in the field, in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the quantities as above determined, measured in square feet, at the unit prices bid in the Proposal for the item, which price shall include the cost of excavating, grading, subgrade and base course preparation, including the concrete base, installation of the pavers and edge restraint, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 321413 UNIT PAVEMENTS

SECTION 321500 STABILIZED STONE PATHS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF 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. Stabilized Stone Paths

1.03 RELATED SECTIONS

- A. Earthwork
- B. Site Concrete
- C. Traffic Signs
- E. Asphalt Pavements
- F. Landscaping

1.04 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 Landscape 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.

1.05 SUBSTITUTIONS

- A. The Contractor shall submit a base bid as per plan.

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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 Landscape Architect for consideration. If he does so, he must include **a complete comparison of each component and aspect of the specified item versus the proposed substitution including a price clarification** for such substitutions. **Any substitution must be approved in writing by the Landscape Architect.**

1.06 QUALITY ASSURANCE

- A. Work under this item must be done by a single firm specializing in the work.

1.07 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.
- 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete work under this item as rapidly as portions of the site become available.
- B. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- C. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- D. Do not install paths until after all utility lines, backfilling and grading has been completed.
- E. Clean-up and Protection
 1. During work keep pavements clean and work area in an orderly condition.
 2. Protect work and materials from damage due to operations by other contractors, trades and trespassers.
 3. Repair or replace damaged materials as directed by the Landscape Architect.

1.09 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.

- B. Pavements may be inspected for acceptance in parts agreeable to the Landscape Architect, provided work offered for inspection is complete.
- C. When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

1.10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than one (1) year from the date of final acceptance by the Landscape Architect.

PART 2 – PRODUCTS

2.01 STABILIZED STONE PATHS

- A. The materials for stabilized stone paths shall be as shown on the plans or as approved by the landscape architect. Aggregate/Stone Screenings shall consist of ¼- 3/8” crushed aggregate screenings; Color to be “Eastern Walking Trail” as supplied by Green Pro Materials (908) 647-0159, or approved equal. Screenings shall comply with the required composition/gradation standards established by the bonding agent manufacturer.
- B. Bonding Agent Additive- Stabilizer: As supplied by Stabilizer Solutions Inc. 1(800) 336-2468, or approved equal. All materials shall meet the specifications of the manufacturer
- C. Dense Graded Aggregate; Shall comply with the materials as specified by the engineer’s documents.

PART 3 – EXECUTION

3.01 STABILIZED STONE PATHS

- A. The location of the paths shall be as shown on the drawings, as field located by the landscape architect. The DGA sub-base, aggregate and binder shall be installed as shown on the drawings in strict accordance with the stabilizer manufacturer’s specifications.
- B. If trees, tree or vegetative root systems, or other existing landscape or subsurface impediments are encountered in the alignment of the path or paved area layout, the location of the pavement may be altered. All path and paved area layouts shall be approved in the Field by the Landscape Architect prior to clearing, site grading operations and installation of materials.
- C. The entire finished grade of all path surfaces shall be cross pitched to insure positive drainage. The contractor shall commence construction of the pavement by establishing required grades, compacting the subgrade, and installing and compacting the stabilized aggregate. The aggregate and binder shall be mixed thoroughly prior to placement as specified by the manufacturer.
- D. Finished grade shall exactly match finish grade of adjacent vegetated areas, curbs, or pavements. If, upon inspection, the installation of any paths or other paved areas is

deemed unacceptable by the Landscape Architect, it shall be removed and/or replaced or reset by the contractor at no additional expense to the owner. This shall apply up to and including final job inspection.

- E. When fully installed, paths shall be firmly imbedded and secure, and shall be flush and meet smoothly and evenly with adjacent pavements and/or grade. Paths pavement shall be free of any weeds, holes, ruts, or foreign material etc.

PART 4 PAYMENT

4.01 STABILIZED STONE PATHS

- A. Quantity: The quantity for which payment will be made will be the area of stabilized stone paths actually constructed as specified, as measured in the field, in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the quantities as above determined, measured in square yards, at the unit price bid in the Proposal for the item, which price shall include the cost of excavation, grading, subgrade preparation, furnishing and installing the DGA sub-base, the stone paths, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.02 STABILIZED STONE PATHS (MODIFIED)

- C. Quantity: The quantity for which payment will be made will be the unit of stabilized stone paths actually constructed as specified, as measured in the field, in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- D. Payment: Payment will be made for the quantities as above determined, measured at the unit price bid in the Proposal for the item, which price shall include the cost of grading of existing DGA subgrade and preparation, installation of **salvaged existing stabilized stone material**, transitional grading, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 321500 STABILIZED STONE PATHS

SECTION 321601 – SITE CONCRETE WORK

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes exterior cement concrete for the following:
 - 1. Concrete Paving – 4" Thick
 - 2. Concrete used for various site work items
- B. Related Sections include the following:
 - 1. Section 310001 "Earthwork" for sub-grade preparation, grading, and sub-base course.
 - 2. Section 321413 "Unit Pavements"
 - 3. Section 311001 "Site Clearing"
 - 4. Section 013599 "Traffic Signs"
 - 5. Section 051200 "Structural Steel"
- C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.03 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement or structure mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at the Project site. Design mixes shall include materials with batch weights, sieve analysis for coarse and fine aggregate and test results indicating that proposed mix will meet project requirements.
 - 1. Submit written reports to Landscape Architect and Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Landscape Architect. Written reports shall indicate class of concrete, batch ingredients with weights, sieve analysis for coarse and fine aggregates, manufacturer's cut sheets for all admixtures, and results of (30) compressive strength tests showing that proposed mix will meet project requirements. Compressive strength test results to be based upon use of 6 x 12 cylinders. Mixes based upon other cylinder sizes will not be accepted.

- 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. Details showing complicated reinforcing arrangements shall be shown at $\frac{1}{4}" = 1'-0"$ or greater scale. Show all concrete wall reinforcement on elevation drawings at a scale not less than $\frac{1}{4}" = 1'-0"$. Do not submit placement plans showing only piece marks referencing a cut list. Submit description of reinforcement supports.
- D. 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.
- E. Material Certificates: Signed certifying that each of the following materials complies with requirements:
 - 1. Cementitious material and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Form materials and form-release agents.
 - 8. Bonding agent or adhesive.
 - 9. Joint fillers.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced installers including mixing and placement of stamped concrete pavement, who has completed pavement 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. Manufacturer Qualifications: A firm experienced in manufacturing of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
 - 1. Acquire cement and aggregate from same source for all work.
- C. 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. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source, and each admixture from the same manufacturer.
- E. Codes and Standards: Comply with provisions of the following codes; specifications and standards, except where more stringent requirements as shown or specified:
 - 1. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - 2. ACI 301, "Specification for Structural Concrete."
 - 3. ACI 304, "Guide for Measuring, Mixing, Transporting and Placing Concrete."
 - 4. ACI 305, "Hot Weather Concreting."
 - 5. ACI 306, "Cold Weather Concreting."
 - 6. ACI 308, "Standard Specification for Curing Concrete."
 - 7. ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 8. ACI 318, "Building Code Requirements for Structural Concrete."
 - 9. ACI 347, "Guide to Formwork for Concrete."
 - 10. CRSI, Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
 - 11. All material and work for concrete shall conform to applicable sections of the "New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition" and all subsequent supplemental specifications unless otherwise noted.
- F. Concrete Testing Service: **Contractor** to engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
- G. Any concrete which does not satisfactorily meet the tests shall be removed and replaced at contractor's expense and as directed by the Owner's Representative.
- H. Professional Engineer Qualifications: A New Jersey licensed professional engineer who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring that are similar to those indicated for this Project in material, design, and extent.
- I. Contract Closeout submittals: Comply with requirements of General Conditions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Store to avoid contact with the ground and in a location protected from vehicular traffic.
- C. Cover reinforcement to protect from inclement weather.

1.06 PRE-APPLICATION MEETING:

- A. Convene pre-application meeting before start of application of chemical stained concrete.
- B. Require attendance of parties directly affecting work of this section, including:
 - 1. Contractor.
 - 2. Landscape architect.
 - 3. Applicator.
 - 4. Manufacturer's representative.
- C. Review:
 - 1. Mock-ups.
 - 2. Materials.
 - 3. Preparation.
 - 4. Moisture testing.
 - 5. Application.
 - 6. Sealing.
 - 7. Protection.
 - 8. Coordination with other work.

PART 2 PRODUCTS

2.01 FORM

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.
- B. 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.
- C. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, $\frac{3}{4}$ by $\frac{3}{4}$ inch, minimum.
- E. 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. Formulate form-release agent with rust inhibitor for steel form facing materials.
- F. 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 $\frac{1}{2}$ inch (25 mm) to the plane of the exposed surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.

2.02 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into rolled sheets, 6 X 6 – W2.9 x W2.9 W.W.F.
- B. Reinforcement Bars: ASTM A615/A615M, Grade 60, deformed. Each reinforcing bar shall have an embossed identifying symbol indicating grade. Steel without such symbols may be rejected.
- C. Reinforcement Accessories: 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, or plastic. Use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2.03 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, [1/2 to 1-1/2 inches (13 to 38 mm)] long.
- A. Portland Cement: ASTM C 150, Type I or II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Coarse Aggregate Size: ASTM C 33.
 - 2. Fine Aggregate: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a #50 mesh screen.
- C. Water: Clean, potable, free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that are deleterious to concrete or reinforcement and complying with ASTM C 94.
- D. Pozzolanic mineral admixture, ASTM C 618, Class C or F (Fly ash) shall be permitted only in mixes for foundations, grade beams, pile caps, column pedestals, and piers, and shall not exceed 15% of a design mixes' cementitious material.
- E. Calcium Chloride, Thiocyanates, or Admixtures containing more than 0.05% Chloride ions are not permitted in the concrete.

2.05 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.15 percent for exterior concrete and 0.30 percent for other concrete, water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. All concrete to contain water reducing admixture or high range water reducing admixture. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260. Acceptable products include, but are not limited to:
 - 1. "Air Mix" by The Euclid Chemical Co., Cleveland, OH.
 - 2. "Daravair" by Grace Construction Products, Cambridge, MA.
 - 3. "Sika AER or AEA-15" by Sika, Lyndhurst, NJ.
 - 4. Or Approved Equal.

Note the following:

Provide air entrainment for all other concrete applications where concrete is exposed to the elements.

- C. Water-Reducing Admixture: ASTM C 494, Type A. Acceptable products include, but are not limited to:
 - 1. "Eucon WR-75" by Euclid Chemical Company, Cleveland, OH.
 - 2. "WRDA w/Hycol" by Grace Construction Products, Cambridge, MA.
 - 3. "Pozzolith" by Master Builders, Cleveland, OH.
 - 4. Or Approved Equal.
- D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E. Acceptable products include, but are not limited to:
 - 1. "Accelguard 80" by The Euclid Chemical Company, Cleveland, OH.
 - 2. "Daraset" by Grace Construction Products, Cambridge, MA.
 - 3. "Trimix-NCA" by Sonneborn, Shakopee, MN.
 - 4. Or Approved Equal.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D. Acceptable products include, but are not limited to:
 - 1. "Eucon Retarder" by Euclid Chemical Company, Cleveland, OH.
 - 2. "Daratard 17" by Grace Construction Products, Cambridge, MA.
 - 3. "Polyheed" by Master Builders, Cleveland, OH.
 - 4. Or Approved Equal
- F. The slump of the concrete from the truck shall be checked prior to the field installation of any admixtures. The required slump shall be in accordance with the specified measurements prior to the addition of the admixture. No water shall be added to the mixture after admixture has been added to the mix in the field.

2.05 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete, equal to:
 - 1. Cimfilm; Axim Concrete Technologies.
 - 2. Finishing Aid Concentrate; Burke Group, LLC (The).
 - 3. Spray-Film; ChemMasters.

4. Or Approved Equal.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Clean, potable, free of injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that are deleterious to concrete or reinforcement.

2.06 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or flexible, closed cell foam in accordance with ASTM D 5249, Type I and Type 3.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Non-shrink Grout: ASTM C 1107, Grade A, non-metallic, non-shrink, high strength grout, suitable for interior and exterior, above and below grade applications. Minimum compressive strength of 6,000 psi in 28 days. Acceptable products include or equal to:
 - 1. "Dry Pack Grout" or "NS Grout" by The Euclid Chemical Co., Cleveland, OH.
 - 2. "Set Grout" by Master Builders, Cleveland, OH.
 - 3. "SikaGrout 212" by Sika, Lyndhurst, NJ.
 - 4. Or Approved Equal.
- D. Sealers – single component, colorless liquid specifically formulated to seal concrete surfaces. Acceptable products include or equal to:
 - 1. "Diamond Clear" by The Euclid Chemical Co., Cleveland, OH.
 - 2. "Kue-N-Seal" by Sonneborn, Shakopee, MN.
 - 3. "Luster Seal" by Tamms Industries, Mentor, OH
 - 4. Or Approved Equal.
- E. Bond breakers – Waterbourne, VOC complaint form release agent. Acceptable products include, or equal to:
 - 1. "Eucoslip VOX" by The Euclid Chemical Co., Cleveland, OH.
 - 2. "Cast-Off WB" by Sonneborn, Shakopee, MN.
 - 3. "Aquafoam" by Tamms Industries, Mentor, OH
 - 4. Or Approved Equal.

2.07 CONCRETE MIXES

- A. Mixture proportion data – Submit for acceptance for each type and strength of concrete, either field test data or trial mix data used to establish required average compressive strength of the mixture in accordance with ACI 301 section 4.2.3.4 – Documentation of average

compressive strength. Proportion normal-weight concrete according to ACI 211.1 and ACI 301. Submitted mixes must be based upon testing of 6 X 12 test cylinders. Testing based upon other test cylinder sizes will not be accepted.

- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Foundations, abutments, retaining walls, piers & curb:
 - 1. Compressive Strength (28 Days): 4,000 psi.
 - 2. Maximum Slump: 4 inches.
 - 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
- E. Sidewalks, Aprons, Exterior Slabs: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 4,000 psi. (Air-entrained), unless otherwise noted.
 - 2. Maximum Slump: 4 inches
 - 3. Maximum Water-Cementitious Materials Ratio = 0.40.
- F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 5~7% with a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated.
- G. Do not allow entrapped air content to exceed 3 percent (naturally occurring).

2.08 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Heat bending and/or straightening of reinforcement is not permitted

2.09 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 to Owner's on-site representative.
- B. 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.
- C. Concrete will be rejected if more than 1-1/2 hours has elapsed from the time water was first added to mix at the Concrete Batch Plan, or as noted above.
- D. Discharge all wash water at the Batch Plan or other prearranged discharge point, not at jobsite. Concrete discharge shall be done in strict compliance with all local, state, and national environmental laws.

2.10 BASE COURSE

- A. Provide dense graded aggregate conforming to NJDOT Specifications, Section 901.1.01.

2.11 JOINT FILLER

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork. Use standard color, which closely matches adjacent concrete color.

2.12 BRICK PAVER

- A. At curb ramps shall be a 4"x8"x2" as manufactured by Endicott Clay Products Company or approved equal

2.13 DETECTABLE WARNING PAVER

- A. At curb ramps shall be an ADA Detectable Warning Paver 4"x8"x2" with raised nodes as manufactured by Endicott Clay Products Company.

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared sub-base surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and sub-grade is ready to receive pavement.
- B. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.02 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. Construct forms tight enough to prevent loss of concrete mortar.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal. Do not use rust-stained steel form-facing material.
- E. Chamfer exterior corners and edges of permanently exposed concrete. Provide 3/4" bevel on all re-entrant corners of formed concrete surfaces exposed to public view.
- F. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items. Provide additional bracing at openings and discontinuities in formwork.
- G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.04 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 or by Trades requiring such embedded items. Install anchor bolts, accurately located, to elevations required. Bridge anchor rods shall be set using the approved anchor bolt layout drawing provided by the bridge fabricator. The foundation plans prepared by the Engineer shall not be used to set anchor rods.
- B. Anchors rods, leveling plates, railing sleeves and brackets and all other embedded steel items shown on Contract Drawings. Install at location and elevations shown on the Contract Drawings within allowable tolerances as specified in SECTION 051200 – Structural Steel. Survey of embedded items is required, refer to 321601, section 3.16.

3.05 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 concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. No loads are to be placed on such items until seven (7) days after casting.
- B. 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.
- C. 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.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder 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. Field bending or straightening of bars partially embedded in concrete is permitted only where shown on the Contract Drawings. Do not field cut reinforcement unless specifically pre-approved by Landscape Architect.

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Do not use reinforcement having any of the following defects:
 - 1. Bar lengths, depths, and bends which exceed fabrication tolerances.
 - 2. Reinforcing bars with reduced cross-sectional area due to rust or other cause.
- F. Install reinforcing in the forms before concrete is placed. No reinforcing bars shall be driven or forced into concrete after the concrete has attained its initial set.
- G. Scheduling – Place reinforcement sufficiently in advance of placing concrete to permit inspection, and correction, if required.
- H. Use bars of single length, except where the length required is greater than stock length. Lap necessary splices as shown on the drawings sufficiently to develop the strength of the bars by bond. Lap splices in accordance with ACI 318. No splices shall be made unless shown on the drawings and shop drawings. Where continuous bars are called for, lap splices shall meet requirements of ACI 318 but not be less than 48 diameters.
- I. Minimum concrete cover for reinforcement, except for extremely corrosive atmospheres, other severe exposures, or fire protection, shall be as follows:
 - 1. Footings and other principal structural members in which concrete is deposited against the ground...3 inches between steel and ground.
 - 2. Where concrete surfaces, after removal for forms, are exposed to weather or ground:
 - a. For bar more than 5/8 inches in diameter 2 inches
- J. All corners and intersections of concrete walls are to be reinforced with corner bars per contract documents.
- K. Field bending or straightening of bars partially embedded in concrete is not permitted. Do not field cut reinforcement unless specifically pre-approved by Engineer.
- L. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- M. Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

3.07 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 3. Provide tie bars at sides of pavement strips where indicated.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 20 feet unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler 1/2 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler 1/2-inch below finished surface and place colored caulk, matching color of concrete over joint filler in areas designated for stamped concrete.
 5. Place top of joint filler 1/4-inch below finished concrete surface if joint sealant or colored caulk is not indicated.
 6. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints (**only where indicated all other joints shall be sawed**): Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch (6 mm).
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Location: For slabs or wide pavements, locate control/contraction joints 10-feet center to center or as indicated on drawings. For sidewalks locate control/contraction joints every 4-linear feet.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Eliminate tool marks on concrete surfaces unless otherwise directed in writing.
 1. Radius: 1/4 inch (6 mm).

3.08 CONCRETE PLACEMENT

- A. Verification of Conditions (By Installer): Examine conditions under which structural concrete is to be placed and notify prime contractor in writing of any conditions detrimental to proper and timely concrete placement. Do not proceed with placement until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Notify other Prime Contractors, Subcontractors, and other parties involved in the Project in ample time to allow installation of their work prior to concrete placement.
- C. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Refer to specification SECTION 310001 – Earthwork for required in-place density of footing sub-grade.
- D. Do not add water to concrete during delivery, at project site, or during placement, unless approved by engineer. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- E. Do not use concrete that has stood for over 30 minutes after leaving the mixer or concrete that has contained its water content for more than 1 ½ hours in work. Independent testing agency will reject such concrete.
- F. 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.
- G. Deposit concrete in forms in horizontal layers no deeper than 12 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.

- H. 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.
- I. 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.
 - 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.
- J. General: Concrete shall not be placed until forms, reinforcing, piping, pipe sleeves, conduit inserts, anchors, and all embedments have been inspected and approved. Water and foreign matter shall be removed from forms and excavations. No concrete for foundations shall be placed on earth that has been backfilled or otherwise disturbed. All soil bottoms for footings shall be approved by professional soils engineer before placing concrete.
- K. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

3.09 FINISHING FORMED SURFACES

- A. General: Wetting of concrete surfaces during screening, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. **Provide non directional wood float finish, unless otherwise specified.**
 2. Medium-to-Fine-Textured Broom Finish (**only where indicated**): Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 3. Medium-to-Coarse-Textured Broom Finish (**only where indicated**): Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.
- C. 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. Exposed portions of concrete abutments shall receive "rubbed finish" in accordance with ACI standards. Monolithic finish 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.
- D. Related Unformed Surfaces: At tops of abutment, 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 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.
- B. Curbs: Provide monolithic finish to curbs 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.

3.11 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. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by the following methods:
1. Moisture Curing: Keep surfaces continuously moist with water for not less than seven days.
 2. Protect concrete surfaces from damage from construction equipment, materials, and methods, from application of curing procedure, and from rain or running water.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Landscape Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval. All costs associated with repair of defective concrete surfaces are to be borne by contractor.

- B. Perform structural repairs of concrete, subject to Landscape Architect's approval, using epoxy adhesive and patching mortar.
- C. Repair materials and installation not specified above may be used, subject to Landscape Architect's prior approval.

3.13 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch (6 mm).
 - 2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
 - 3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
 - 8. Joint Spacing: 3 inches (75 mm).
 - 9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 - 10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: **Contractor** will engage 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.
 - 1. Testing Frequency: Obtain one composite sample (6 cylinders) 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.
 - a. Testing agency will cast one set of (4) cylinders for each abutment even if such pours are done from one truck.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pours of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. 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.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of six standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days for information and three at 28 days for acceptance. Compressive strength test results for acceptance shall be the average of the compressive strengths from the three (3) specimens tested at 28 days. If one specimen in the test shows evidence of improper sampling, mold-

ing or testing. Discard the specimen and consider the strength of the remaining cylinder to be the test result. If more than one specimen in a test shows any defects, discard the entire test. Retain one (1) specimen for testing at 56 days as deemed necessary by Architect. Accelerated testing of concrete as an alternate to standard testing is not allowed.

- a. Retaining wall: Test (1) cylinder at 7 days, Test (3) cylinders at 28 days.
7. 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.
 8. Testing Agency will report all test and inspection results to the Architect, Prime Contractor and Owner's Representative within seven (7) days after tests and inspections are performed except that test results that do not meet project requirements shall be reported in writing to Architect, concrete manufacturer, and Prime 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.
 9. 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.
 10. 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 to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Costs associated with all additional testing shall be borne by the Contractor.
 11. Reinforcement: Testing and inspection agency shall visually inspect all reinforcement and welded wire fabric for proper size, spacing, concrete cover and lap splice lengths as shown on Contract Documents prior to placement of concrete. Testing agency to provide signed & sealed Letter of Certification that all reinforcement was placed in accordance with the Contract Documents.
 12. Contractor's Duties Relative to Testing:
 - a. Contractor shall designate one individual in his organization to be responsible for conducting Contractor's duties relative to testing. Individual will be instructed in his duties by testing agency. Individual shall not be changed without notice to Landscape Architect.
 - b. Delivering of materials to testing agency's laboratory for use in verifying design mixes.
 - c. Furnishing labor to obtain and handle samples for compression testing, performing slump tests, and air content tests.
 - d. The Contractor shall notify the inspection and testing agency at least 36 hours prior to each anticipated pour in order to allow the agency adequate time for inspection of concrete form work, reinforcing, steel and concrete placement.

- e. Storing cylinders at project site in storage box for 24 hours after molding. Temperature controlled, insulated storage box shall be furnished by the Contractor for use by the testing agency.
- f. Maintaining field test data sheet for each set of concrete specimens.

3.16 CERTIFIED SURVEY OF ANCHOR BOLTS, LEVELING PLATES AND BEARING PLATES

- A. Upon completion of the setting of anchor bolts, leveling plates and bearing plates the Contractor will obtain a certified survey, prepared by a surveyor licensed in the Project State, of the following:
 - 1. Location and elevation of anchor bolts.
 - 2. Levelness and elevation of leveling plates.
 - 3. Location, levelness and elevation of bearing plates.
- B. As-built survey shall show proposed design location of item and as-built location. As-built location shall be given in two orthogonal directions. (North-South & East-West). As-built survey shall be submitted to the Landscape Architect for review and approval. Contractor shall allow for ten (10) standard working days for review of as-built survey prior to proceeding with any corrective repairs.
- C. Contractor shall correct any deficiencies in location, levelness and elevation at his own cost and at the direction of the Architect. The corrected work will be resurveyed at the Contractor's cost. All proposed corrective repairs are to be submitted to the Landscape Architect & Engineer for review prior to the start of any corrective work. All corrective work must have full-time inspection by Owner's Testing Agency. All costs associated with the review, approval, and inspection of corrective repairs will be borne by the Contractor.

3.17 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.18 BACKFILLING

- A. After the concrete has attained the required strength, the spaces in front and back of the curb, and paving, where applicable, shall be backfilled with approved material in layers of not more than 4-inches in depth, which shall be thoroughly compacted mechanically to the required elevation and cross section.

PART 4 PAYMENT

4.01 Concrete Paving- 4" Thick

- A. Quantity: The quantity for which payment will be made is for the area of concrete sidewalks, measured in square yards, constructed as described above and shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the unit price in the Proposal for the Item Concrete Paving -4" thick, which price shall include the cost required for the all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.02 Miscellaneous Concrete

- A. Payment: No payment shall be made for Miscellaneous Concrete as part of this specification section. Payment for work included in this specification section shall be included in the various bid items constructed from the work described in this specification section.

END OF SECTION 321601 SITE CONCRETE WORK

SECTION 321723 - PAVEMENT MARKINGS

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 painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.
 - 2. Section 099123 "Interior Painting" for painting interior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Burlington County and NJDOT for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed marking similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing marking materials similar to that indicated for this Project and with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seal's unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for alkyd materials 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ennis-Flint (by PPG), or approved equal.

2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Preformed or extruded thermoplastic, complying with AASHTO M 249; colors complying with FS TT-P-1952.
 - 1. Color: As indicated or as standard for proposed use.

- B. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.
 - 1. Color: As indicated or as standard for proposed use.
- C. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.
 - 1. Color: As indicated or as standard for proposed use.
- D. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes. ONLY USE FOR TEMPORARY MARKINGS UNLESS OTHERWISE DIRECTED.
 - 1. Color: As indicated or as standard for proposed use.
- E. Glass Beads: AASHTO M 247, Type 1 made of 100 percent recycled glass.
 - 1. Roundness: Minimum 75 percent true spheres by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.
- C. Remove, by grinding or other mechanical means, any existing striping in conflict with proposed work.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (9 mils dry) for non-thermoplastic striping. Thermoplastic minimum thickness requirement is 90 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb./gal. (0.72 kg/L).

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

PART 4 - PAYMENT

4.1 PAVEMENT MARKINGS

- A. Quantity: The quantity for which payment will be made is a lump sum for all work as described above and shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item PAVEMENT MARKINGS, which price shall include the cost required for the removal of existing markings, preparation of surfaces, installation and all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 321723

SECTION 323100 FENCES & WOOD STRUCTURES

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF 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. TIMBER BOLLARD
- 2. 3 RAIL FENCE
- 3. MAINTENANCE GATE
- 4. TRASH ENCLOSURE

1.03 RELATED SECTIONS

- A. Earthwork

1.04 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 Landscape 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.

1.05 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 Landscape Architect for consideration. If he does so, he must include price clarification for such substitutions. **Any substitution must be approved in writing by the Landscape Architect.**

1.06 QUALITY ASSURANCE

- A. Work under this section must be done by a single firm specializing in the work.

1.07 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.
- 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.

1.08 PROJECT CONDITIONS

- A. Contractor shall coordinate with Engineer's Phasing Schedule in order to proceed with, and complete the work as rapidly as portions of the site become available.
- B. Contractor shall determine location of underground utilities and shall perform work in a manner which will avoid possible damage, hand excavating as required.
- C. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- D. Do not clear, excavate, or construct any items until after all utility lines, backfilling and grading has been completed. Timber gates must be properly coordinated with pavement installation.
- E. Clean-up and Protection
 - 1. Keep pavements 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 Landscape Architect.

1.09 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.
- B. Work may be inspected for acceptance in parts agreeable to the Landscape Architect, provided work offered for inspection is complete.
- C. When inspected work does not comply with requirements, replace rejected work and apply to the Landscape Architect for re-inspection until the area is found to be acceptable.
- D. Remove rejected materials promptly from project site.

1.10 WARRANTY

- A. The Contractor shall guarantee all work under this Section against defects in materials and workmanship for not less than one (1) year from the date of final acceptance by the Landscape Architect, or as required by the contract.

PART 2 – PRODUCTS

- 2.01 TIMBER BOLLARD
- 2.02 3 RAIL FENCE
- 2.03 MAINTENANCE GATE
- 2.04 TRASH ENCLOSURE

- A. All wood fence and wood structure materials shall be as shown on the plans or as approved by the landscape architect.

PART 3 – EXECUTION

- 3.01 TIMBER BOLLARD
- 3.02 3 RAIL FENCE
- 3.03 MAINTENANCE GATE
- 3.04 TRASH ENCLOSURE

- A. All bollards, fences, gates and wood structures shall be constructed to the dimensions, lines and grades as shown on the drawings in locations directed by the Landscape Architect. Where applicable, fences and gates shall be constructed as shown on the drawings and installed in strict accordance with the manufacturer's specifications.
- B. Contractor shall provide shop drawings to Landscape Architect of gates, manufactured products and attachments for approval prior to installation.
- C. When fully installed bollards, fences, gates, and wood structures shall be level, firmly attached, secure and free of any play whatsoever.
- D. All gates shall operate smoothly and allow for ground clearance for full operation and be plumb in all directions.
- E. All connectors shall be firmly tightened and Fences and Wood Structures shall be free of any marks, dents, holes, etc. resulting from transportation to the site and actual on-site construction.

PART 4 PAYMENT

- 4.01 TIMBER BOLLARD
- 4.02 3 RAIL FENCE
- 4.03 MAINTENANCE GATE
- 4.04 TRASH ENCLOSURE

- A. Quantity: The quantity for which payment will be made will be the actual number of units actually constructed as specified, as measured in the field in the locations shown on the plans or as directed by the Landscape Architect or Engineer.
- B. Payment: Payment will be made for the quantity as above determined, at the unit price bid in the Proposal for the items which prices shall include the cost of furnishing, assembling

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and installing the bollards, fences, gates, attachment, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF 323100 FENCES AND WOOD STRUCTURES

SECTION 328400 – PLANTING IRRIGATION

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, but is not necessarily limited to, the following:
 - 1. Landscape irrigation.
 - 2. Accessories and components necessary to provide a complete, operable irrigation system
- B. Related Sections:
 - 1. DIVISION 01 – GENERAL REQUIREMENTS
 - 2. DIVISION 03 – CONCRETE
 - 3. DIVISION 22 – PLUMBING
 - 4. DIVISION 26 – ELECTRICAL
 - 5. DIVISION 31 – EARTHWORK
 - 6. DIVISION 32 – EXTERIOR IMPROVEMENTS
 - 7. DIVISION 33 - UTILITIES

1.3 RELATED WORK

- A. Irrigation contractor shall verify the related work has been completed and compliant with local jurisdictions.

1.4 PRE-INSTALLATION MEETING

- A. Conduct a conference/meeting at the project site. Review methods and procedures related to the site landscape irrigation system including, but not limited to the following:
 - 1. The General Contractor is to contact the Owner's Representative a minimum of 60 days prior to the scheduled date of commencement of irrigation installation.
 - 2. Meet with Owner's Representative to review Contract Documents.
 - 3. Verify current drawing release date with contractor's documents.
 - 4. Review submittal procedure including codes, substitutions, product data, qualifications, and AS-BUILT.
 - 5. Review project conditions including tap & meter size, permits, utility locations and water conditions.
 - 6. Review methods and procedures related to irrigation installation.
 - 7. Review and finalize construction schedule and verify availability of materials, contractor's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 8. Review warranty guidelines.

1.5 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design 100 percent coverage irrigation system of areas indicated. Plans and details shall be prepared by a Certified Irrigation Designer qualified by The Irrigation Association and shall include comprehensive engineering analysis for points of connection by a qualified professional engineer, using performance requirements and design criteria indicated in this specification or approved equal.
1. Available land records indicate the following soil conditions:
- a. Type: 6"+ of Topsoil
 - b. Texture: Sandy Loam
 - 1) Sand: +/-70 percent.
 - 2) Silt: +/- 17 percent.
 - 3) Clay: +/- 13 percent.
 - c. Structure: Granular
 - d. Infiltration Rate: N/A
 - e. Contractor shall confirm topsoil composition in accordance with topsoil testing requirements of Planting and Seeding specification.
- B. Install a fully automatic underground sprinkler system to irrigate landscape and turf areas. All heads of different types, i.e., sprays and rotors, and heads with different precipitation rates or pressure requirements shall be on different zones. Drip zones shall not be on the same zones as sprays or rotors. Turf, plantbeds, or other areas of greatly varying watering requirements shall also be on different zones. The limits of work as indicated on the irrigation plan shall be the limit of irrigation work.
- C. Design shall accommodate future system expansion into event lawn area.
- D. Provide all materials, labor, transportation, equipment, fees and permits necessary to install a fully operational system in accordance with plans and specifications.
- E. The contractor shall acquire the necessary right of way or lawful authority that may be necessary for approved crossings or occupation of any roads, streets or alleys upon which the work will be done.
- F. Point of connection for the irrigation system will be provided at the approximate location shown on plan. Connection shall be to existing irrigation well providing water to existing community gardens.
- G. Point of connection shall be protected by a RPZ type backflow prevention device. Device shall be installed satisfying all local codes. All water downstream of the backflow preventer shall only be used for irrigation purposes only. No cross-connections shall exist, or the system shall be deemed unusable. Contractor shall verify and coordinate that the irrigation point of connection meets the minimum requirements listed on the plan. If these requirements cannot be met, the contractor shall notify the owner's representative and irrigation designer during design and prior to beginning installation.
- H. Power for the irrigation controller shall be a 120-volt, 20 amp building electrical circuit. Location shall be in mechanical chase of restroom building. Coordinate exact controller location with owner's representative. Contractor shall verify that electrical power meets the

manufacturer's requirements for the controller. If requirements cannot be met contractor shall notify the owner's representative and irrigation consultant prior to installation.

- I. Location of Sprinklers and Specialties: Upon final design, make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.
- J. Irrigation performance specifications may be superseded by local regulations and/or building codes.

1.6 QUALITY ASSURANCE

- A. Installer shall be a firm engaged in the full-time installation of this type of system with at least five (5) years of successful experience.
 - 1. An employer of workers that include a certified irrigation designer qualified by The Irrigation Association.
 - 2. A list of three (3) past projects similar in scope to this project, including names and telephone numbers of owners/operators and date of project installation shall be submitted with the bid. References must be projects installed within the last two (2) years.
- B. Installation firm shall carry appropriate levels of liability, automobile, and worker compensation insurance. Certificates of insurance shall be provided to the owner prior to the commencement of work.
- C. Materials, equipment, and methods of installation shall comply with, but not limited to, the following codes and standards:
 - 1. State and Local Standards and Codes.
 - 2. Uniform Plumbing Code.
 - 3. National Electric Code.
 - 4. American Society for Testing and Materials (ASTM).
 - 5. National Sanitation Foundation (NSF).
 - 6. Underwriters Laboratory (UL).
 - 7. The Irrigation Association (IA).
 - 8. The Plastic Pipe and Fittings Association (PPFA).
- D. Any components located inside any buildings or garages shall be installed in accordance with related project specifications. This includes, but not limited to, Plumbing and Electrical.
- E. Random product substitutions will not be accepted. The functionality of the irrigation design and system is based on characteristics of the products listed in these specifications and accompanied plan. Contractors wishing to substitute any product must submit, in writing, reasons for proposed substitution, product specifications, revised plan, and performance data to the Owner's Representative and Irrigation Consultant. If written approval is granted, products may be substituted. Any products found during the final walk through, not previously approved, will be removed and replaced with an acceptable product at the contractor's expense.
- F. Manufacturer
 - 1. All irrigation equipment shall be produced by a manufacturer as part of a regular product line.
 - 2. All irrigation products shall be purchased through a local servicing distributor.

1.7 TESTS

- A. The contractor shall perform all tests in the presence of the Owner's Representative.

1.8 SUBMITTALS – PRIOR TO COMMENCING INSTALLATION

- A. Design Drawings: Irrigation systems, drawn to scale, on which components are shown and coordinated with each other, electrical and plumbing drawings and the Architect, using input from Installers of the items involved. Also include adjustments necessary to avoid plantings and obstructions such as signs and light standards.
- B. Product Data: Submit one (1) portable document file (pdf) of manufacturer's catalog cuts or equipment data sheets for the following products:
 - 1. Controller and controller accessories
 - 2. Electric and manual valves
 - 3. Sprinkler heads and spray nozzles
 - 4. Drip line and components
 - 5. Pipe and pipe fittings
 - 6. Valve boxes
 - 7. Swing joints and/or flex pipe
 - 8. Control wire, sensor wire, grounding components, and splice connectors
 - 9. Solvent and primer
 - 10. Backflow preventer and enclosure
 - 11. Sleeving material for use under existing and proposed pavements.
- C. Submit shop drawings, a written proposal including a breakdown of components to be used in the system, and a complete description of the scope of work. Include all information for plumbing and/or electrical permits and fees.
- D. Reference list and certificates of insurance as described in Section 1.6.

1.9 SUBMITTALS – UPON COMPLETION OF INSTALLATION

- A. Upon completion of the irrigation system and in conjunction with the application for final payment, submit the Maintenance and Operation Manual. The manual shall include the following:
 - 1. One (1) copy of the Record Drawings at a scale matching that of the construction drawings. The record drawings shall be furnished on paper and an electronic file in AutoCAD format (dwg) and portable document format (pdf). Sprinkler heads shall be drawn to a scale location accuracy of 1'-0" or less.
 - 2. One (1) copy of a diagram illustrating the final irrigation station layout. Diagram should be sized so that it can fit in the door of the controller.
 - 3. One (1) complete set of the "APPROVED" submittals required in paragraph 1.8.
 - 4. One (1) copy of the suggested "System maintenance and operating instructions." Instructions shall include, but are not limited to:
 - a. Procedures for proper winterization.
 - b. Procedures for proper spring start-up.
 - c. Controller programming instructions.
 - d. Suggested grow-in, and post establishment programs.
 - e. List of any areas that will receive sub-surface irrigation, and that will require to be hand-watered until establishment.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Pack, ship, deliver, receive, handle and store all material in a manner as to protect from damage due to weather, vandalism, theft, and other hazards.
- B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.11 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify owner's representative no fewer than seven (7) days in advance of proposed interruption of water service.
 - 2. Do not proceed with interruption of water service without owner's representative's written permission.
- B. Locate and mark all underground utilities (primary and secondary). These may include, but not limited to, gas, water, cable television, communication, and electric lines. Any damage to underground utilities caused by the installer shall be repaired at the contractor's expense.
- C. Protect all hardscape and planted areas from damage due to system installation. Preserve all existing tree roots over 1.5" by hand trenching these areas. Repairs to existing hardscape features such as walks, asphalt paving, curbs, etc., shall be made to restore these areas to their original condition at the contractor's expense.
- D. Coordinate irrigation system work with landscaping work to provide adequate water to newly installed plantings.

1.12 WARRANTIES

- A. Contractor shall be responsible for the first year's winterization and subsequent spring start-up procedures and shall perform these operations in presence of the owner's representative.
- B. Contractor shall guarantee all labor and material for a period of two (2) years from the date of substantial completion of the irrigation system. Additionally, where the equipment manufacturer offers a longer warranty period, the contractor shall honor the extended warranty to the full extent of the equipment manufacturer's Warranty Statement. Contractor's labor during any extended warranty period shall be paid promptly by the owner's representative. The contractor shall make or undertake all repairs during the warranty period within 48 hours after written notice or verified communication by the owner's representative. If the contractor fails to make repairs, the owner's representative will make the repairs at the expense of the contractor.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

- A. Pipe below grade shall be PVC 1120, Class 200, SDR 21 and be in accordance with the latest revision of ASTM Standard 2241.
 - 1. 2.5" and smaller sized pipe shall be solvent weld joint pipe.
 - 2. Acceptable manufacturers are:

- a. Cresline Plastic Pipe Co., Inc.
 - b. J-M Manufacturing Company, Inc.
 - B. Pipe size shall be as listed on plan. Velocity shall not exceed 5 feet per second in any pipe. ½", ¾", or 1 ¼" sized pipe will not be accepted.
 - C. Sleeves below grade: Sleeving material shall meet or exceed specifications set by local jurisdiction. Contractor shall verify approved sleeving material prior to installation. No sleeves less than four inches will be accepted.
 - D. Pipe Fittings:
 - 1. Pipe fittings 2.5" or smaller shall be PVC Schedule 40 solvent weld socket type meeting or exceeding ASTM D-2466.
 - a. Acceptable manufacturers:
 - 1) Dura Plastic Products, Inc.
 - 2) Spears Manufacturing Company.
 - 3) Lasco Fittings Inc.
 - 2. PVC Schedule 80 nipples shall be used at all threaded connections. Schedule 40 male adapters are acceptable on the downstream side of remote-control valves.
 - 3. Fittings necessary for tapping into the domestic water source shall be the appropriate size and type for the domestic water source pipe type.
 - 4. Fittings used for backflow preventer shall be as recommended by the manufacturer.
 - E. Swing Joints & Swing Pipe:
 - 1. Sprinklers: All sprinklers shall be connected to lateral lines using 3/8" thick-walled poly swing pipe and appropriate fittings.
 - 2. Quick-Coupling Valves: All quick coupler valves shall be installed using unitized factory assembled swing joints. Swing joint shall be model number g13s-218 as manufactured by Lasco Fitting, Inc or approved equal.
- 2.2 PIPING JOINING MATERIALS
- A. Primer and solvent: As recommended and documented by the pipe and fitting manufacturer(s). Primer to be a color other than clear.
 - B. Teflon tape: Shall be used at all NPT threaded connections. Liquid Teflon is not acceptable.
- 2.3 CONTROL CABLE, COMMUNICATION CABLE, AND SPLICES
- A. Communication Cable: Wire shall be twisted pair, solid-core, color-coded red/blue pairs, enclosed in a PE sleeve available in 6 colors for in-ground identification. The wire shall be 14 AWG model number ID1XXX as manufactured by Hunter Industries or approved equal.
 - B. Splices: All splices shall be made with 3M Corporation model DBR/Y-6 direct burial splice kits as manufactured by the 3M Corporation or approved equal.
- 2.4 MANUAL VALVES
- A. IPS Iron Push-On Gate Valve: Sizes 3" or larger. Resilient wedge, non-rising stem, 250 PSI CWP iron body gate valve. Valve shall be model number P-619-RW manufactured by Nibco, Inc., or approved equal. One 5' valve operating key for 2" square operating nut shall be provided to the owner upon completion of irrigation installation.

- B. Bronze Gate Valves: Valves shall be of domestic origin, meeting specifications MSS SP-80. Valve shall have a bronze cross-handle and non-rising stem. Valve shall be model number T-113-IRR-X manufactured by Nibco, Inc., or approved equal.

2.5 AUTOMATIC CONTROL VALVES

A. Remote Control Valves:

- 1. ICV: The valve shall be normally closed, electronically-actuated, diaphragm-operated, remote-control valve. The valve shall be in a globe style body with Female National Pipe Thread (FNPT) inlet and outlet. The valve shall be equipped with a flow control mechanism and internal filter.

The valve shall be available with an optional adjustable pressure regulating device.

The standard solenoid shall be a 24 VAC unit with a 370 mA inrush current and 190 mA holding current at 60 cycles and a 475 mA inrush current and 230 mA holding current at 50 cycles.

Valve shall be manufactured by Hunter Industries Incorporated or approved equal.

2.6 SPRINKLERS

A. Plastic, Gear Drive, Rotary Sprinklers:

- 1. I-20 PRB: The sprinkler shall be of the gear-driven, rotary type. The sprinkler shall have a radius adjustment capability by means of a stainless-steel nozzle retainer/radius adjustment screw.

The sprinkler shall be adjustable in both part circle and a true full continuous 360° circle configuration.

The sprinkler shall be equipped with a drain check valve. The sprinkler shall be available in a 4 inch, 6 inch, and 12 inch pop-up stroke. The unit shall have a 3/4 inch FNPT inlet.

The sprinkler shall have a pre-set 45 psi pressure regulator built into the riser.

The sprinkler shall be manufactured by Hunter Industries Incorporated or approved equal.

B. Plastic, Spray Sprinklers:

- 1. Pro-Spray PRS40: The sprinkler shall be of the fixed-spray type designed for in-ground installation.

The sprinkler shall be available with a 4, 6, or 12-inch pop-up stroke. The sprinkler shall be installed with a drain check valve.

The sprinkler shall have a pre-set 40 psi pressure regulator built into the riser.

The sprinkler shall be installed with a MP Rotor nozzle, manufactured by Hunter Industries Incorporated, as noted on plan.

The sprinkler shall be manufactured by Hunter Industries Incorporated or approved equal.

- C. Other sprinkler types as may be required by final design shall be manufactured by Hunter Industries Incorporated or approved equal.

2.7 QUICK COUPLERS

- A. Quick Coupling Valve: Brass, single lug quick couplers with 1" fipt inlet. Cover to be vinyl. Contractor shall provide the owner with one (2) keys and one (2) hose swivels upon completion of irrigation installation.

The valve shall be model number HQ-44-LRC as manufactured by Hunter Industries Incorporated or approved equal.

2.8 CONTROLLERS AND ACCESSORIES

- A. Controller:

- 1. ACC2 Decoder: The controller shall be a full-featured commercial-industrial product for the purpose of irrigation management and monitoring of control valves, flow, and sensors, via two-wire decoder connections.

The controller shall have built-in sensor inputs for 3 Clik sensors, 1 Solar Sync sensor, and 3 Flow-Sync sensors. The controller shall have 3 built-in pump and master valve outputs.

The controller shall have a minimum of 3 wire terminals to allow for 3 different two-wire paths in the field.

The controller shall have the ability of evapotranspiration (ET) based scheduling. Weather data to be used for scheduling shall be available via a wireless or wired weather sensor.

The controller shall be capable of reading and reacting to flows. Controller shall be able to halt irrigation when monitoring an extended high or low flow reading.

The controller shall be as noted on the plan manufactured by Hunter Industries Incorporated or approved equal.

- B. Accessories:

- 1. Solar Sync: The sensor shall automatically adjust run times for controller stations based on a local evapo-transpiration sensor, when connected to a compatible automatic irrigation controller.

The sensor shall be mounted within 200 feet of the irrigation controller. The sensor shall include individual sensors for solar radiation, air temperature, and shall also include a rain sensor. The rain sensor shall be capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a pre-selected amount.

The rain sensor circuitry shall utilize 2 sets of hygroscopic disks to activate switches in the unit. One switch will be for the total rainfall compensation unit and the other will turn off the irrigation system within 5 minutes of the onset of precipitation, depending on the intensity. In addition, the built-in temperature sensor shall be capable of interrupting the power from the irrigation controller to the valves when ambient air temperature falls below 37 degrees Fahrenheit.

All sensors shall be integrated into a single array and shall be housed in an UV and corrosion resistant plastic casing.

The sensor shall be model number SOLAR-SYNC-SEN as manufactured by Hunter Industries Incorporated or approved equal.

2. Decoders:
 - a. Remote Control Valve Decoder: Valve decoders shall be available in 1, 2, and 4 station configurations. Valve decoders shall be the model numbers listed on the plan, as manufactured by Hunter Industries Incorporated or approved equal.
3. Flow Sensor: The flow sensor shall be an in-line impeller type. It shall be installed in a schedule 40 PVC tee.

The flow sensor model number shall be manufactured by Hunter Industries or approved equal.
4. Wifi Module: To allow web-based communication, remote control and access via Centralus Irrigation Management Application, as manufactured by Hunter Industries or approved equal. Program and connect to owners available wifi.

2.9 BOXES FOR AUTOMATIC CONTROL VALVES

- A. Valve boxes: Boxes shall be constructed of HDPE structural foam with polymer covers. Covers shall be locked to the box using a captive bolt and loc-kit. "IRRIGATION CONTROL VALVE" shall be factory printed on all covers. Valve boxes and covers shall be manufactured by Carson Industries, LLC., The Rain Bird Corporation, or approved equal.

2.10 BACKFLOW PREVENTION DEVICE

- A. Reduced Pressure Principal Assembly: The reduced pressure principle backflow preventer shall be ASSE Listed 1013, rated to 180°F, and supplied with full port ball valves. The main body and access covers shall be bronze (ASTM B 584), the seat ring and all internal polymers shall be NSF Listed Noryl and the seat disc elastomers shall be silicone. The first and second checks shall be accessible for maintenance without removing the relief valve or the entire device from the line.

The backflow prevention device shall be manufactured by Zurn Industries, LLC, or approved equal. Refer to building plumbing plans and specifications for additional information.

The backflow preventors located outside of buildings shall be installed over a concrete pad that is 6" larger on all sides of the enclosure and protected with a wire clamshell style enclosure, type SBBC-"xx"SS as manufactured by StrongBox or approved equal. Final

enclosure size shall be appropriately sized to accommodate the installed backflow preventor and required clearances for operation. Provide Heavy Duty Commercial pad lock, keyed to County standard. Coordinate with Owner's representative for final location.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine the site for the conditions under which the work is to be performed. Communicate the existence of any unsatisfactory site condition to the owner's representative prior to the commencement of installation. Start of installation means contractor accepts existing site conditions.
- B. Make all field measurements necessary for the work noting the relationship of the irrigation work to other trades. Coordinate the irrigation system installation with the work of other trades as required. The irrigation system shall be laid out essentially as indicated on the irrigation drawing, with minor adjustments for variations in the final planting plan. Major changes will require review and acceptance in writing from the irrigation consultant.
- C. Protect existing landscaping, hardscaping, structures, utilities, etc. from damage. Damage to any existing entity on the site will be the responsibility of the contractor.
- D. Contractor's on-site field supervisor must have thorough knowledge of irrigation system installation. Owner's representative must have a means of communication with field supervisor through mobile phone for emergency purposes.
- E. All items and materials shall be installed following manufacturer's recommendations.

3.2 PIPING INSTALLATION

- A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved by the irrigation consultant.
- B. Install sleeving as required under all existing hardscape features via boring. Sleeves may be installed by trenching where hardscape features are not in place. Sleeving shall have a cover of 24" above the pipe where vehicular traffic is not a concern. Sleeving installed in areas of vehicular traffic shall have a cover of 36" above the pipe.
- C. Mainline pipe shall be installed using a wheel trencher or other suitable equipment. Lateral pipe 1.5" or smaller may be installed using a vibratory plow at the contractor's discretion. If pipe needs to be installed in areas not accessible, or deemed to be in an unsafe area to operate equipment, trenches shall be dug by hand.
- D. All mainline pipe shall have a cover of 18". Lateral piping shall have a cover of 12". If sharp edged debris or rock is encountered, excavate to width and depth required to allow 3" of sand bedding around pipe while maintaining the depth specified.
- E. Locating tape shall be installed with the mainline in areas that do not have control wire.
- F. Pipe shall be snaked from side to side in the trench to allow for expansion and contraction.
- G. Install groups of pipes parallel to each other, spaced to permit valve servicing.

- H. Cut, fit, and solvent-weld pipe and fittings strictly following manufacturer guidelines. Allow all joints to cure a minimum of 24 hours prior to applying pressure to system. Solvent-weld joints shall not have signs of puddling or excessive primer and/or solvent. Pipe and fittings with signs of excessive primer/solvent outside of joints will be replaced at the contractor's expense.
- I. Backfilling shall be accomplished in 6" maximum lifts, with the first being placed by hand to exclude all debris over 1" in diameter and all sharp-edged rock of any dimension. Mechanical tamping shall be done after each lift to eliminate trench settling. Contractor shall be responsible for the repair or restoration of trench settlement.

3.3 VALVE INSTALLATION

- A. **Lines shall be thoroughly flushed prior to valve installation.**
- B. Manual gate valves shall be installed with the operating handle in a vertical position and centered in a 10" nominal diameter valve box with a 6" or 8" sleeve.
- C. Remote control valves shall be installed with the flow control handle in a vertical position and positioned in a 10" circular valve box (single valves) or 12" x 17" nominal rectangular valve box (two valves) to allow ready access for adjustment and/or minor repair. The bottom of the valve box shall contain a 3" gravel sump. There shall be 2" of clearance between the bottom of the valve and gravel sump.
- D. Quick coupler valves shall be installed with the top of the cover parallel and two inches below the valve box cover. The valve shall be centered in a 10" circular valve box. Quick coupler valve shall be restrained using rebar and stainless-steel hose clamps.
- E. Splices, decoders, grounding connections, etc. shall be installed inside a 7" nominal diameter valve box.
- F. Top of valve boxes shall be installed with risers and blocking as necessary to set the box plumb and 1" above finished grade in lawn areas in order to allow for thatch layer and/or sod thickness. In mulch or other areas, valve boxes should be set flush with finish surface.
- G. Valve boxes shall be cleaned of all soil and 2" of clean pea gravel shall be placed in the bottom of the valve box.

3.4 DECODERS

- A. All decoders and line surge protectors shall be installed inside valve boxes.
- B. Every valve box containing a remote-control zone valve(s) shall have its own decoder. If two valve boxes are installed next to each other, a multi-valve decoder may be shared.
- C. All splices shall be made with 3M DBY/R-6 splice kits or approved equal.

3.5 SPRINKLER INSTALLATION

- A. Lines shall be thoroughly flushed prior to installing sprinklers.
- B. Sprinklers to be installed flush and plumb with final grade. All heads to be installed approximately 2" from the nearest hardscape feature.

- C. Adjust sprinklers for proper distribution and to prevent overspray onto walkways, driveways, buildings, and other unattended surfaces as much as possible.
- D. Spacing shall not exceed that shown on irrigation plan.

3.6 WIRE INSTALLATION

- A. Wiring shall be laid along with and under the mainline with enough slack to avoid wire being pulled taut during backfill procedure
- B. Approximately 5' of wire shall be left at all remote-control valves to allow extraction of the solenoid from the valve box without cutting the wire. The extra wire shall be neatly coiled in the valve box.
- C. Do not place more than one wire connection in a splice kit.
- D. All wires passing under hardscaped areas shall pass through approved sleeving.

3.7 IRRIGATION CONTROLLER INSTALLATION

- A. Controller shall be located approximately where shown, with owner's written approval.
- B. Controller shall be located at least 15 feet from high current drawing electric motors such as pumps, AC units, compressors, etc.
- C. Controller shall be grounded as recommended by manufacturer.
- D. Weather sensor shall be installed in the vicinity of the controller as shown on the plan. Sensor shall be located in a location where it receives rain and sunlight. It shall not be in a location that receives water from the irrigation system. Final location shall be approved in writing by the owner and irrigation consultant.

3.8 IRRIGATION CONTROLLER PROGRAMMING

- A. Controller shall be programmed by irrigation contractor. Initially the controller shall be programmed for the water application rate requested by the landscape architect. This initial program should remain in effect until after the "grow-in" period. After this period, the controller shall be reprogrammed to run based on controller calculated ET rates and data received from the onsite weather sensor.
- B. Contractor shall include with their scope of work, time necessary to adjust controller as recommended by the manufacturer to provide optimal operation. This shall include site visits during and after the grow-in period to set zone percentage adjustments to promote water conservation, plant health, and encourage deep root growth. Two post-installation programming visits shall be included, after the initial post grow-in schedule is programmed. These shall be scheduled approximately 30 days apart. If heavy rainfall is experienced within this 30-day window, a 60-day window may be used.
- C. Contractor shall provide the owner with on-site controller training.

3.9 GROUNDING IRRIGATION CONTROL SYSTEM

- A. A good ground source is a mandatory component of overall surge protection for Irrigation Control Systems. Grounding electrode(s) should be placed at the controller location. The resistance to the grounding electrode must not exceed 10 ohms when measured with a Megger Earth Resistance Testing Instrument or equivalent. One or more of the following grounding methods should enable 10 ohms or less resistance to be accomplished.
- B. Connection of a #8 bare copper wire to a 3/8" inch diameter by 8 foot long (minimum) copper clad steel rod driven into the earth at a distance greater than 8 feet from the controller. Additional lengths may be required to achieve the required resistance reading. Connection of the wire to the grounding rod shall be made utilizing a CADWELD or similar product that will not be affected by expansion and contraction due to temperature variances. Split bolt type connections will not be accepted. Connection shall be made inside of a valve box.
- C. If soil conditions (i.e., ledge rock) prevent copper clad rod installation, one or more copper plates can be buried under well compacted soil or grounding enhancement material.
- D. Coordinate grounding with Electrical Contractor.

3.10 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 4. Grounding Test: Confirm manufacturer's minimum resistance has been satisfied.
 - 5. Contractor shall demonstrate operation of each zone to Owner's Representative. It is preferable to demonstrate working drip irrigation prior to backfill of landscape mulch.
- B. Any irrigation product will be considered defective if it does not pass tests and inspections.

3.11 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions.

3.12 ADJUSTING

- A. Adjust settings of controllers as recommended by manufacturer.
- B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with finish grade.

3.13 CLEANUP

- A. Flush system, and clean sprinkler screens and other inline filters immediately prior to final acceptance.

- B. Upon completion of daily work, remove all debris relating to the installation of the system and clean adjacent hardscape features as necessary.
- C. Upon completion of all irrigation installation work, remove from the site all leftover material and equipment as to leave the site in the same or better condition as when work was started.
- D. Any disturbance to existing surfaces and materials shall be restored to match adjacent undisturbed areas. All lawn and landscape areas shall be completely backfilled and compacted prior to seeding, sodding, or mulching.

3.14 OBSERVATION, ACCEPTANCE AND DEMONSTRATION

- A. Work found to be unacceptable must be corrected within five (5) calendar days. Remove rejected materials promptly from the project.
- B. Upon completion of work, the Owner's Representative or Irrigation Consultant will issue a punch list for work to be corrected. Where work does not comply with requirements, rejected work must be replaced.
- C. Train Owner's maintenance personnel to adjust, operate, winterize and maintain system including automatic control valves and controllers. Coordinate training with project landscape contractor.
- D. If a site visit to verify substantial completion has been scheduled and the Owner's Representative or Irrigation Consultant arrives at the site and determines the irrigation system is not substantially complete (all system components in place, operational and checked) the Contractor shall be responsible for all costs incurred by the Landscape Architect or Irrigation Consultant to visit the site. Reimbursable expenses include, but are not limited to, the following: mileage, airfare, consultant's time, parking fee, meals, rental car, etc. All incurred expenses will be deducted from the final contract amount.
- E. Contractor shall be responsible for the first year's winterization and subsequent spring start-up procedures and shall perform these operations in presence of the owner's representative.

PART 4 PAYMENT

4.01 IRRIGATION SYSTEM

- A. Quantity: The quantity for which payment will be made will be made is the lump sum price for all work as described above, including water connection, and shown on the plans or as directed by the Owner's representative.
- B. Payment: Payment will be made for the work described above, at the lump sum price in the Proposal for the Item IRRIGATION SYSTEM, which price shall include the cost required for all materials, labor, equipment and all else necessary therefore and incidental thereto.

END OF SECTION 328400

SECTION 329000 PLANTING, SEEDING & SODDING

PART 1 - GENERAL

1.01 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.

1.02 SCOPE OF WORK

- A. Extent of landscape development work is shown on the drawings and in schedules. The Contractor shall supply all equipment, materials and labor to complete the "Landscape Work" as described, which includes the following:
 - 1. Shade Trees
 - 2. Shrubs, Perennials, Groundcovers
 - 3. Sodding (**when used**)
 - 4. Lawn Seeding
 - 5. Topsoiling

1.03 RELATED SECTIONS

- A. Site Clearing/Demolition
- B. Earthwork
- C. Site Concrete

1.04 REFERENCED STANDARDS

- A. All plant material shall meet or, if indicated on the plant list, exceed the standards set forth in the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen (ANSI-Z60.1). Height, spread and caliper sizes shall be as indicated on the plant list.
- B. Nomenclature will be in accordance with Hortus III by L.H. Bailey.

1.05 SUBMITTALS

- A. Certification
 - 1. General
 - a. Certificates of inspection as required by governmental authorities, including State issued Inspection Certificates, for each nursery supplying material.
 - b. Other data, manufacturer's product data, labels, and material data sheets, substantiating that material complies with specified requirements for manufactured products including but not limited

to:

- i. Fertilizer
- ii. Pre emergent herbicide
- iii. Mycorrhizal Fungal Inoculant
- iv. Mulch
- v. Peat moss
- vi. Premium Compost
- vii. All other soil amendments, as determined by soil testing

2. Topsoil Testing

- a. A laboratory test shall be conducted for each source of topsoil.
- b. Topsoil testing shall be done prior to planting and shall be conducted by a Certified Soil Testing Laboratory at the Contractor's expense. The testing laboratory shall take representative topsoil samples as deemed necessary and shall submit results to the Engineer and Landscape Architect.
- c. Topsoil test results shall include recommendations for topsoil amendments and fertilizer rates in order to ensure a proper growth medium for seed mix and sod.
- d. 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)

3. Topsoil Amendments and Fertilizer

- a. Manufacturer's or vendor's certified analysis for topsoil amendments and fertilizer materials.

4. Seed

- a. Vendor's certified statement for each seed mixture required, stating botanical and common names, percentage by weight and percentages of purity, germination and weed seed for each seed species.
- 5. Sod
 - a. Vendor's certified analysis of sod composition and other data substantiating that sod material complies with specified requirements.
- 6. Samples as required in PART 2 – PRODUCTS, including but not limited to:
 - a. Mulch
 - b. Topsoil
 - c. Screened Leaf Compost
 - d. Gying Materials
- B. Landscape Schedule
 - 1. Contractor shall submit proposed schedule indicating dates for selection, tagging, digging, transportation, and installation of all plant material. Once schedule is accepted, revise dates only as approved in writing by the Landscape Architect after documentation of reasons for delays.

1.06 SUBSTITUTIONS

- A. The Contractor shall submit a base bid as per plan. Prior to the commencement of work, the contractor shall provide the Landscape Architect 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.
 - 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 Landscape Architect for consideration. If he does so, he must include price clarification for such substitutions. Any substitution must be approved in writing by the Landscape Architect.

1.07 QUALITY ASSURANCE

- A. Landscape work must be done by a single firm specializing in landscape work.
- B. All personnel shall be properly supervised in a manner that assures the property is protected from damage, that the safety of all personnel and the public is protected, and that all contract work is done in a professional manner according to accepted horticultural standards.
- C. Source Quality Control
 - 1. **All trees must be tagged by the Landscape Architect prior to digging.**

2. The Landscape Architect, Owner, or Owner's Representative reserves the right to inspect, select and tag all plant material at the point of origin, prior to digging. Acceptance at the nursery does not preclude rejection at the site for just cause.
 3. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
 4. Analysis and Standards (Topsoil Amendments): Package standard products 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.
 5. Trees, Shrubs and Other Plant Material
 - a. All plant material shall meet or, if indicated on the plant list, exceed the standards set forth in the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen (ANSI-Z60.1). Height, spread and caliper sizes shall be as indicated on the plant list.
 - b. 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.
 - c. All plant material shall come from sources within the same USDA / Agricultural Research Service Plant Hardiness Zone as is the Project Site and within 200 miles of the Project Site for a period of not less than two (2) years immediately prior to the project. Any material from sources outside this zone is not acceptable. In order to promote greater acclimation of plant material, it is desirable that plants be acquired from nurseries located in Burlington County.
 - d. Balled and Burlapped Material
 - 1) 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.
 - 2) Ball sizes shall be accordance with American Association of Nurserymen Standards unless specifically noted.
 - e. Container grown stock shall be used only when specified and shall conform to standard set forth in 1.07:C:1:b:4.
 6. All trees and shrubs shall be labeled with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- D. Quality, Size and Inspection
1. Caliper and Height Measurement
 - a. Balled and Burlapped Material

- 1) In size grading of single trunk trees, caliper shall take precedence over height.
 - 2) 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.
 - 3) Branching of shade trees shall start between 6'-7' above ground, unless otherwise noted.
 - 4) For multi-stemmed trees, at least one trunk must meet caliper size.
 - 5) In all cases, Contractor shall make every effort to meet both caliper and height standards specified on the plans and in the schedules.
 - 6) Plants shall be measured before pruning with branches in normal position.
 - b. Container Grown Stock
 - 1) The size of container grown shrubs shall be measured by the height and width of the plant.
 - 2) Container grown trees shall be measured by the same standards as listed in 1.07:C:1:a.
 - 3) Herbaceous perennials shall be measured by pot size, not top growth.
 - 4) 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.
2. The Contractor shall furnish quantities necessary to complete the planting as shown on the plans.
- a. All plants shall equal or exceed measurements specified in the plant list which are the minimum acceptable.
 - b. Plants shall be measured before pruning with branches in normal position. Necessary pruning shall be done at time of planting.
 - c. 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.
3. When all plant material has been selected and pre-tagged by the Landscape Contractor, the Landscape Architect shall be notified in order to schedule his nursery inspection with a minimum of 3 days advance notice.
- a. The Contractor shall accompany the Landscape Architect on all

inspections.

- b. 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.
 - c. All trees must be approved in the field by the Landscape Architect before digging begins.
- 4. 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. Collected stock shall have rootballs in accordance with American Association of Nurserymen Standards.
 - 5. Any material and/or work may be rejected, if, in the opinion of the Landscape Architect, or Owner/Owner's Representative, it does not meet the requirements of the specifications. All rejected material shall be promptly removed from the site by the Contractor at his own expense.

1.08 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials

- 1. Deliver packaged materials in containers bearing weight, analysis and name of manufacturer.
- 2. Protect materials from deterioration during delivery and while stored at the site.

B. Trees and Shrubs

- 1. The Contractor shall provide freshly dug plant material.
- 2. The Contractor shall advise the Landscape Architect, of all deliveries at least 48 hours prior to its arrival at the site, so that trees may be inspected upon delivery to the site.
- 3. 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.
- 4. Protective covering shall be provided during delivery.
- 5. Roots of bare root material shall be protected during delivery and handling to guard against drying out and damage.
 - a. 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.
- 6. All container grown plants shall be grouped and watered daily until planting.
- 7. Deliver trees and shrubs after preparations for planting have been completed, and plant immediately.

- a. 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.
 - b. Do not remove container grown stock from containers until planting time.
8. The Contractor shall, in loading and unloading or handling plants, exercise the utmost care to prevent injuries to the branches or roots.
9. The solidity of the rootball shall be carefully preserved. Plants delivered with broken rootballs will be rejected.

1.09 PROJECT CONDITIONS

- A. 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).
- B. Contractor shall contact NJ One Call, determine location of underground utilities, and shall perform work in a manner which will avoid possible damage, excavating by hand if required. The Contractor shall take proper precautions not to disturb or damage any sub surface utilities. In the event that any sub-surface utilities are uncovered or damaged, the Contractor shall immediately notify the Landscape Architect so that contract work may be relocated or stopped until the damage can be repaired. The Contractor shall be financially responsible for any damage to utilities and structures and shall properly maintain the protection of same.
- C. The contractor shall closely observe any limits of disturbance noted on the plan or as directed by the Landscape Architect, Owner or Owner's Representative, and / or confine disturbance to areas of proposed improvements.
- D. The Contractor shall be liable for any damages to property caused by his operations and in the event of damages, he shall at his own expense restore all disturbed or damaged areas to their original condition. All materials, equipment and personnel shall be limited to the immediate work area.
- E. Grade stakes shall be maintained until their removal is mutually agreed upon by all parties concerned.
- F. 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 immediately.
- G. 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.
- H. Cleanup and Protection
 1. During landscape work keep pavements clean and work area in an orderly condition.

2. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers.
3. Treat, repair or replace damaged landscape work as directed by Landscape Architect.
4. Staging areas, temporary storage areas, and areas adjacent to work areas, shall be returned to the original condition upon project completion, and any landscape material (new or existing) damaged as a result of planting operations, shall be replaced at the Contractor's expense.

1.10 INSPECTION AND ACCEPTANCE

- A. When landscape work is completed, including maintenance, Engineer and Landscape Architect will, upon request, make an inspection to determine acceptability.
 1. Landscape work may be inspected for acceptance in parts agreeable to Landscape Architect and Engineer, provided work offered for inspection is complete, including maintenance.
 2. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and Engineer and found to be acceptable. Remove rejected plantings and materials promptly from project site.

1.11 WARRANTY

- A. **The Contractor shall guarantee all plant material installed under this Contract for a period of one (1) year after the Landscape Architect's Final Acceptance of all planting, at no additional cost to the Owner.**
- B. The Contractor shall replace any trees, shrubs or plants that are dead or have failed to thrive, whether due to natural causes or that are, in the opinion of the Landscape Architect, unhealthy, unsightly or have lost their design value or natural shape because of dead branches, excessive pruning, or inadequate or improper maintenance. Unless otherwise mutually agreed to, all the above-mentioned material will be removed by the Contractor within ten (10) days of notification by the Landscape Architect. **Replacement planting is to be completed no later than the succeeding planting season.**
- C. Where dead trees or shrubs have been identified, the dead material shall be removed, including stakes and guying material. If seasonal conditions require waiting until next planting season to replace the material, a dead tree may be cut flush to the ground within 10 days of notice, if necessary, topsoil and grass seed shall be added to the tree pit to eliminate tripping hazards, until replacement planting can be completed.

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. All topsoil, both newly furnished and stockpiled (if any), shall be tested by a certified independent soil testing laboratory. (The tests required are listed under 1.05:A:2.) These tests will determine the appropriate amendments, as well as application rates of such amendments, necessary to bring the topsoil to the desired condition.

- B. 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:

Passing	Retained On	Percentage
1" Screen		100%
1" Screen	1/4" screen (Gravel not more than).....	3%
1/4" Screen	#100 USS sieve (course, medium and fine sand)....	40% - 60%
#100 USS Sieve	(Very fine sand, silt and clay in equal proportion)	40% - 60%

- C. 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.
- D. Topsoil must also be free of plants or plant parts of Bermudagrass, Quackgrass, Johnsongrass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, etc..
- E. 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.
- F. No topsoil shall be shredded, screened, mixed or worked in a wet or frozen state.
- G. 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.

2.02 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 and planting pits 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 his representative.
- Mycorrhizal inoculants shall be added to all planting backfill in granular, powder or liquid form. The species formulation used in the inoculants 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. Submit product sample and manufacturer's product literature for approval.

2.03 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. Pine Bark: Potting grade pine bark with no particle size larger than 1/2" and less than 10% wood fiber.
- D. Bone Meal: Finely ground and with a minimum analysis of 2% nitrogen and 20% available phosphoric acid.
- E. Sand: Clean washed sand free of toxic materials.
- F. Perlite: Conforming to the National Bureau of Standards PS 23.
- G. Vermiculite: Horticultural grade, free of toxic substances.
- H. 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.
- I. 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.
- J. Mycorrhizal Fungal Inoculant: PHC Tree Saver, as manufactured by Lebanon Turf, or approved equal.
- K. Leaf Compost: Screened and free of trash.
- L. Premium Compost: For planting soil amendment. As manufactured by Laurel Valley Soils ph: 610.268.5555, or approved equal. STA Certified Compost by US Composting Council. Derived from a blend of high-grade agricultural feedstock, including mushroom compost, hay, straw, horse manure, poultry litter, corn cobs, cottonseed hulls, cocoa bean hulls, lime, gypsum, and carbon sources. Screened to 1/2."
- M. Premium Biosolid Compost: For topdressing and topsoil amendment for lawns. Material comprised of multiple clean waste feedstocks including green waste, biosolids, food waste and prepared in compliance with the US Compost Council Seal of Testing Assurance Program, as manufactured by WeCare Compost, ph: 888.325.1522 or approved equal.
- N. Biosolid Compost: For topdressing and topsoil amendment for lawns. Material Shall be WeCare Compost, biosolids and wood fiber compost, by WeCare Denali, (888)-325-1522, or approved equal. **Material is available for this project at no cost for projects owned by Burlington County for pick up at Burlington County Resource**

Recovery Complex, Mansfield NJ via coordination with Burlington County Department of Resource Conservation. Delivery also available for nominal fee.

2.04 FERTILIZER

- A. 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.
- B. 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 products 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.
- C. For perennials, annuals and bulbs: Fertilizer shall be a complete fertilizer that is slow released.
- D. 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.

2.05 WEED CONTROL

- A. Any herbicide used must be approved by Federal and State Authorities for use in this area.
- B. Contractor shall submit brand name and content of broad-leaved herbicide to be used to Landscape Architect for approval prior to any weed control applications.
- C. Application rates shall be as appropriate for amount of weed control required and shall be as per manufacturer's recommendations.
- D. Contractor shall post warning flags in all areas treated with weed control.
- E. Application shall not occur during times when the general public might be subject to exposure.

2.06 MULCH

- A. Shredded Hardwood Bark Mulch
 - 1. Aged Bark Mulch as manufactured by County Conservation Company, ph: 856.277.6900, or approved equal. Material shall be natural double-shredded bark (or pine bark with less than 10% sapwood), dark brown in color, or approved equal. Mulch shall be free of landscape waste, compost, dyes, recycled lumber, pallets, or other manufactured products. Use of composted products is not permitted.
 - 2. Material shall be uniform in size, free of foreign matter and suitable for

topdressing of trees, shrubs or perennials.

3. Samples shall be submitted to Landscape Architect for approval prior to purchase and delivery.

B. Premium Hardwood Mulch (when specified)

1. Premium Hardwood Mulch as manufactured by County Conservation Company, ph: 856.277.6900, or approved equal. Material shall be natural double-shredded hardwood from trees, light brown in color. Mulch shall not contain any wood derived from pallets, or other manufactured products. Use of composted products is not permitted. Material shall be free of landscape waste, compost, dyes, and treated or painted lumber.
2. Material shall be uniform in size, free of foreign matter and suitable for topdressing of trees, shrubs, or perennials.
3. Samples shall be submitted to Landscape Architect for approval prior to purchase and delivery.

B. Mulch for Seeded Areas

1. Straw shall be free of rot, mildew, noxious weed seeds and shall be small-grained, such as wheat or barley.
2. 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.
3. Prefabricated wood shaving mat shall be woven and may contain light weight plastic netting on one or both sides.
4. Stabilizing Materials
 - a. Mulch anchoring tool is a tractor-drawn implement designed to punch and anchor mulch into the soil surface a minimum of 2".
 - b. 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.
 - c. Liquid Mulch Binder
 - 1.) 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.

- 2.) Applications of liquid mulch binder shall be heavier at the edges of mulched areas where wind catches the mulch.
- 3.) Liquid mulch binder shall be applied uniformly at a rate of 6 gal./ac.
- d. 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.

2.07 GUYING AND STAKING

A. Stakes

1. 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.

B. Flat Woven Webbing

1. Fasten trees to stakes using ¾" 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.

2.08 TREE WRAP

- ### A. Tree wrap shall not be used.

2.09 ANTI-DESICCANT

- ### A. Anti-desiccant shall be emulsion type, film forming agent designed to permit transpiration but retard excessive loss of moisture from plants.
- ### B. Deliver in Manufacturer's fully identifiable containers and mix in accordance with Manufacturer's instructions.

2.10 PLANT MATERIALS

A. Deciduous Trees

1. Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI-Z60.1 for type and species indicated.
2. Provide single stem trees except where otherwise specified.
3. Provide balled and burlapped material unless otherwise specified.

B. Shrubs

1. 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.
2. Provide balled and burlapped material unless otherwise indicated.

- C. Coniferous and Broadleafed Evergreens
 - 1. Provide evergreens of sizes scheduled or shown and which meets or exceeds ANSI-Z60.1 standards.
 - 2. 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.
 - 3. Provide quality evergreens with well balanced form complying with requirements for other size relationships to the primary dimension indicated.
 - 4. Provide balled and burlapped material unless otherwise indicated.
- D. Container Grown Stock (Ornamental Grasses and Perennials)
 - 1. Provide container grown material conforming to ANSI-Z60.1 specifications for container grown stock.
- E. All plant material shall conform to standards set forth in Section 1.07.

2.11 SEED

- A. Lawn Seed
 - 1. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by the Official Seed Analysts of North America.
 - 2. Lawn Seed shall be as supplied by Tuckahoe Turf Farms, Hammonton, NJ (866) 711-2326, or approved equal, and shall match the composition of "Tuckahoe Fescue" Sod mix, as follows:

45% Rebel Exeda Turf Type Tall Fescue
45% Rebel Sentry Turf Type Tall Fescue
10% Tuckahoe Turf Bluegrass Blend
 - 3. Seeding Rates shall be as follows:
 - a. Seeding new lawns: 8 lbs/1000sf.

2.12 SOD

- A. The sod composition shall be as follows:

45% Rebel Exeda Turf Type Tall Fescue
45% Rebel Sentry Turf Type Tall Fescue
10% Tuckahoe Turf Bluegrass Blend
- B. The sod shall be of good texture, free from obnoxious roots, stones, and foreign material. Sod shall be fresh cultivated sod, weed-, disease- and insect-free.
- C. Sod shall be obtained from areas having growing conditions similar to the areas being covered. Sod shall have a clean growth of acceptable grass

and shall be machine cut with not less than 1" loamy sand firmly adhering to the roots.

- D. Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads or torn or uneven edges will not be accepted.
- E. Standard size sections of sod shall be strong enough to support their own weight and retain their shape when suspended vertically from a firm grasp on the upper 10% of the section.
- F. Sod shall not be harvested or transplanted under drought conditions. If the soil is dry, sod shall be watered sufficiently to moisten the soil to a depth at which the sod is to be cut.
- G. Dumping from transport vehicle will not be permitted. Damaged sod or sod that has turned yellow in color will be rejected. Sod shall be inspected at time of delivery by the Landscape Architect and any sod that does not meet the specified standards will be rejected and removed from the job site at the Contractor's expense.
- H. Sod shall be harvested, delivered and installed within a period of 36 hours. However, if high temperature and low moisture extremes occur, installation should occur within 24 hours of harvest. Sod not transplanted within these time periods shall be removed from the job site at the Contractor's expense.

PART 3 - EXECUTION

3.01 SEEDING NEW LAWNS

- A. Preparation of Subgrade
 - 1. Work shall proceed only after rough grading has been completed and the subgrade is within 2/10 of 1' (2.5") of the final subgrade.
 - a. If the subgrade area develops volunteer weed growth, the growth must be eliminated at this phase with glyphosate- 2 treatments, 4 weeks apart.
 - 2. Grades which have been previously established in conformance with the drawings shall be maintained in a true and even grade.
 - 3. **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 Landscape Architect and/or Engineer after tilling and prior to any spreading of topsoil.
 - 4. Limestone shall be spread and worked into the subsoil at an application rate determined by soil test analysis.
- B. Spreading of Topsoil
 - 1. A minimum of 6" of topsoil shall be respread over prepared subgrade. Spread topsoil to the minimum depth required to meet lines, grades and

elevations shown, after light rolling and natural settlement.

2. Apply soil compost over all areas to be seeded. When required by soil testing results/recommendations.
3. Add specified soil amendments based upon the certified lab test results and mix compost and soil amendments (by disc or other mechanical means) thoroughly into the topsoil.
4. Spreading of topsoil shall be performed in such a manner that seeding can proceed with a minimum of additional soil preparation and tillage.
5. 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.
6. 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.
7. Apply fertilizer at rates recommended by the certified lab test results and thoroughly mix into the topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.
8. Plug areas, and groundcover beds only shall receive pre-emergent weed inhibitor.

C. Fine Grading

1. 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, as directed in the field by the Landscape Architect. Limit fine grading to areas which can be planted immediately after grading.

D. Preparation of Unchanged Grades for Lawn

1. 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:
 - a. 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.
 - b. Till soil to a depth of 6" and **apply 2" of compost** and 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.
 - c. 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.

2. Where, in the opinion of the Landscape Architect, **LAWN** is to be planted in areas that have not been altered or disrupted by excavating, grading or stripping operations, and existing turf sustainable prepare soil for planting as follows:
 - a. Decomcompact lawn areas by core aeration to 2" depth or deep tine aeration to up to 6" deep based on level of compaction present.
 - b. Top dress area with ¼" of biosolid compost.
 - c. Drag to provide level uniform surface and break down cores.
 - d. Seed, at full rate, in accordance with Seeding Procedures. Modify procedure only with written approval from the Landscape Architect.
- E. Seeding-
1. Fine grade LAWN AREAS to smooth, even surface with loose, uniformly fine texture. Import topsoil as necessary to level area. Topsoil shall be similar in characteristics to the native soil conditions. Roll, rake and drag lawn areas, remove ridges and fill depressions as required to meet finished grades, as directed in the field by the Landscape Architect, Owner or Owner's Representative. Limit fine grading to areas which can be planted immediately after grading
 2. If and where directed by Landscape Architect, apply Glyphosate type herbicide labeled for wetland use (ex. Rodeo®) as directed on label and at appropriate concentrations to kill existing undesirable vegetation.
- F. SEEDING PROCEDURES - (Broadcast or Hydroseeding will not be permitted.)
1. Prior to seeding operations, the Landscape Architect and/or Engineer shall inspect and approve final grading and topsoil preparation.
 2. Seeding times:
 - a. **Lawn Seeding** shall be between March 15-May 15; or between August 15-September 15.
 - b. These periods may be extended or reduced according to prevailing weather conditions and approval by the Landscape Architect. Seeding shall also be executed as per growers' recommendations.
 3. No seeding shall be done on frozen ground or when temperature is 32 degrees or lower.
 4. 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.
 5. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.
 6. 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.

7. Seeding Procedures- (Broadcast or Hydroseeding will not be permitted.)
 - a. 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.
 8. Sow not less than the quantity of seed specified or scheduled.
 9. 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.
 10. Protect seeded slopes against erosion with erosion netting or other methods acceptable to the Landscape Architect.
 11. Anchor mulch with stabilizing material. Take precautions to prevent damage, or staining, of construction or other plantings adjacent to mulched areas.
 12. 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..
- F. Maintenance of Seeded Areas – See Section 3.06 below.

3.02 SODDING

- A. Preparation of Subgrade (Follow procedure set forth above)
- B. Spreading of Topsoil (Follow procedure set forth above)
- C. Fine Grading (Follow procedure set forth above)
- D. Preparation of Unchanged Grades (Follow procedure set forth above)
- E. Sodding
 1. Prior to sodding operations, the Landscape Architect and/or Engineer shall inspect and approve final grading and topsoil preparation.
 2. During periods of high temperature and low moisture, topsoil shall be lightly irrigated immediately prior to the laying of sod. Allow surface moisture to dry before sodding. Do not create muddy soil condition.
 3. The first row of sod shall be laid adjacent to walkways and/or bedlines under direction of the Landscape Architect. Subsequent rows shall be placed tightly against each. Lateral joints shall be staggered to promote uniform growth. Care shall be exercised to ensure that the sod is not stretched or overlapped and that all joints are butted tightly in order to prevent voids.
 4. All openings in the sod shall be plugged with sod and all joints between sod shall be filled with topsoil mix.
 5. On sloping terrain where erosion may be a problem, sod should be

installed with staggered joints and secured by wooden stakes driven to ground level. If stakes remain above ground level during sod establishment, either remove stakes or drive stakes to ground level once sod has rooted.

6. Sod shall be lightly watered during installation to prevent excess drying.
 7. As sodding is completed in any one section, the entire area shall be rolled to incorporate the sod with the bed. It shall then be thoroughly watered so that the underside of the new sod pad and the soil immediately below the sod is thoroughly wet.
- F. Maintenance of Sodded Lawns – See Section 3.06 below.

3.03 TREE PLANTING & TRANSPLANTING

- A. No tree planting operations shall take place until placing of topsoil has been completed.
- B. 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.
- C. 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. The Contractor will place the color-coded flags to indicate plant locations for approval and possible adjustment by the Landscape Architect.
- D. All transplanting shall be performed in strict accordance with the ANSI A300 Part 6-2005, which are incorporated herein by reference.
- E. Contractor shall place trees above ground in accordance with the flagged locations. The Landscape Architect may request the Contractor to move, turn or relocate the plant material at this time. Under no circumstances shall the Contractor pre-dig tree pits.
- F. Upon final approval by the Landscape Architect of tree placement, the Contractor shall paint a circle around the ball of the tree, move tree and excavate tree pit.
- G. Excavation of Tree Pits
 1. 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.
 2. Tree pits must be a minimum of 2' greater in diameter than the ball of the tree or the spread of its roots.
 3. The depth of the tree 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 tree 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.

4. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.
5. When tree 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 immediately.

H. Placing Trees

1. Place tree in pit by carrying the ball and then lowering it into the pit. Never lift trees by their trunk or branches.
2. 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.
3. Cut and remove rope or wire 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 trunk.

I. Backfilling Tree Pits

1. Tree pits shall be backfilled with topsoil mixture as specified in 2.02.
2. Trees must remain straight throughout backfilling.
3. 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.
4. Never cover top of rootball with soil.
5. Form a soil saucer above finished grade around the outer rim of tree pit.
6. Mulch top of rootball and saucer to a depth of 3" with shredded hardwood bark mulch. Do not place mulch against trunk.

J. Pruning

1. Prune, thin out and shape trees in accordance with standard horticultural practice.
 - a. Pruning shall be restricted to corrective pruning to improve form only. This includes structure, dead, damaged, diseased and/or conflicting branches.
 - b. Do not cut main leader unless directed by Landscape Architect to do so. Remove only injured or dead branches from flowering trees, if any.
 - c. If side branches are cut to balance tree, make all cuts back to a lateral branch or bud.

- d. Final pruning shall be done after trees are in place.
 2. Remove and replace excessively pruned stock resulting from improper pruning.
 3. Remove all tags, labels, strings and wire from tree unless otherwise directed by Landscape Architect.
 4. After final pruning, apply anti-desiccant where appropriate using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.
- K. Tree Wrapping
1. Tree Wrapping shall not be used.
- L. Tree Staking (Trees Under 6" Cal.)
1. 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.
 2. Space 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.
 3. Cut pieces of hose long enough to loop around trunk.
 4. 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.
 5. 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.
 6. Flat Woven Webbing may be used with stakes, instead of wire and hose, for guying. Secure webbing to trees using expandable knots per manufacturer's written instructions.
- M. Tree Guying (Evergreen Trees)
1. 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.
 2. Cut pieces of hose long enough to loop around trunk.
 3. 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.
 4. Place hose around trunk just above lowest stout branch at 2/5 to 3/5 the height of the tree.

5. 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.
7. Flat Woven Webbing may be used with stakes, instead of wire and hose, for guying. Secure webbing to trees using expandable knots per manufacturer's written instructions.

N. Maintenance of Tree Plantings- See Section 3.06 below.

3.04 SHRUB PLANTING

- A. No shrub planting operations shall take place until placing of topsoil has been completed.
- B. Shrubs shall be located above ground in masses or hedges as directed by the Landscape Architect. Under no circumstances shall Contractor pre-dig shrub pits
- C. Following approval by the Landscape Architect of shrub layout, Contractor shall be directed to plant shrubs.
- D. Excavation for Shrubs
 1. Pits (for single shrubs) and Trenches
 - a. Walls of shrub pits or trench 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.
 - b. Pits and trenches must be a minimum of 1' greater in diameter than the ball of the shrub or the spread of its roots.
 - c. The depth of the pit or trench shall be as deep as necessary to accommodate the ball of the shrub so that it will not be necessary to raise or lower the shrub to bring it to the required grade. Shrub pits shall be deep enough to allow 1/8 of the ball of the shrub to be above finished grade. Plants shall rest on undisturbed existing soil or well-compacted backfill.
 - d. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.
 - e. When shrub 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 immediately.
 2. Preparation of Planting Beds
 - a. 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.

E. Placing Shrubs

1. Place shrub in pit by carrying by the rootball and lowering into pit.
2. Remove containers from all container grown shrubs 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.
3. Set shrub straight and in the center of the pit with the most desirable side facing the prominent view.
4. Cut and remove rope or wire 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.

F. Backfilling Shrub Pit

1. Follow procedure set forth in 3.03:I.

G. Pruning

1. Prune out any dead or broken branches.
2. Prune hedges as directed by Landscape Architect.
3. Final pruning shall be done after shrubs are in place.
4. Remove all tags, labels, strings and wires from shrubs unless otherwise directed by Landscape Architect.
5. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
6. After final pruning, apply anti-desiccant where appropriate, using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.

H. Maintenance for Shrub Plantings - See Section 3.06 below.

3.05 PLANTING GROUNDCOVER AND PERENNIALS

A. Preparation of Planting Beds

1. The entire bed subgrade shall be tilled 8" deep . Remove any stones over 1", sticks, roots, rubbish and any other extraneous matter.
2. Dig beds not less than 8" deep and mix with 2" of compost and soil amendments and fertilizer as recommended by soil test analysis.
3. Spread planting soil mixture to a minimum depth required to meet lines, grades and elevations shown, after light rolling and settlement as follows:
 - a. 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.

b. Place remainder of planting soil.

4. Mulch entire planting bed with 2" shredded hardwood bark mulch.

B. Placing Plants

1. 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.

2. Plants shall be installed so that the roots are surrounded by soil below the mulch.

a. Potted plants shall be set so that the top of the pot is even with finished grade.

b. Roots of bare root plants shall be covered to the crown.

3. The entire bed shall be thoroughly watered.

4. Treat the mulched and planted bed with a pre-emergent herbicide only as directed by the Landscape Architect. Apply only when foliage is dry to prevent foliar burn.

C. Maintenance Requirements for Groundcovers and Perennials - See Section 3.06 below.

3.06 MAINTENANCE REQUIREMENTS

A. Maintenance of Seeded and Sodded Lawn Areas - Grass areas shall not be considered for Final Acceptance until a full vigorous stand of turf exists, and at least three (3) successful mowings have been conducted. Re-working and re-seeding or resodding, 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:

1. General Seeded or Sodded Lawn Area Maintenance

a. Proper and adequate watering

b. Re-filling of rain-washed gullies and rutted areas

c. Re-fertilization and lime applications as recommended by soil test analysis

d. Weed, fungus and pest control

2. The Contractor's responsibilities for maintenance of seeded areas shall include, but not be limited to, the following:

a. Re-seeding of any bare areas.

b. If seeded in the fall, or if not acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

- c. Provide proper and adequate watering to initiate and maintain vigorous growth of seed as necessary to establish lawn.
 - d. If seeding is not fully established or accepted prior Owner's required use of seeded areas, the Contractor shall reseed and fully establish lawn at the next available planting period that acceptable to the Owner.
 3. The Contractor's responsibilities for maintenance of sodded areas shall include, but not be limited to, the following:
 - a. Proper and adequate watering
 - 1.) First week: Sod shall be kept moist at all times. Watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least 2".
 - 2.) Second and subsequent weeks: Water the sod as required to maintain adequate moisture in the upper 4" of the soil to promote deep root growth. Once sod is well rooted, as determined by the Landscape Architect upon his inspection, less frequent deep watering should be maintained to encourage deep root growth. Total watering should be the equivalent of 1" of water per week (may be a combination of rainfall and irrigation).
 - b. Re-sodding of any bare areas
 - c. If sodded in the fall, or if not acceptable at that time, continue maintenance the following spring until acceptable lawn is established.
 4. Mowing and Miscellaneous Maintenance of Seeded and Sodded Lawn Areas
 - a. 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.
 - b. 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.
 - c. Edging of all sidewalks, curbs and other paved areas, as well as the limit of sod / seed edge, shall be performed once every other mowing. Debris from edging operations shall be removed and the areas swept clean.
- B. **Maintenance Period for Seeded and Sodded Lawn Areas** - The maintenance period shall extend for 60 days after Final Acceptance, while turf is actively growing. This shall include not less than six (6) weekly mowings.
- C. **MAINTENANCE OF TREE, SHRUB, GROUNDCOVER AND PERENNIAL PLANTINGS**- The maintenance period shall extend one (1) year after Final Acceptance of plantings. Maintenance shall include keeping beds and tree/shrub rings free from weeds, and the application of water, as necessary. One (1) "Spring Clean Up" with re-mulching, and one (1) "Fall Clean Up/Winterization," not necessarily in that order, shall be required.
 1. Work shall be conducted by personnel trained in proper horticultural practices.
 2. Maintenance shall begin immediately after planting.
 3. Contractor shall maintain trees, shrubs, groundcovers and perennials (including the application of adequate water on a weekly basis) until Final Acceptance by Landscape Architect. Continue maintenance as noted in Section C above, during the Maintenance Period.
 4. Maintain trees, shrubs, groundcovers and perennials by pruning, cultivation and weeding, as required for healthy growth, in conformance with standard horticultural practice, during the Maintenance Period.

5. Contractor shall restore planting saucers, tighten and repair stake and guy supports and reset trees as required.
6. Treat trees, shrubs, groundcovers and perennials as necessary to keep plants free of insects, disease and fungus.
7. Watering
 - a. All material shall be thoroughly watered at one (1) week intervals throughout the summer as follows:
 - 1.) 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.
 - 2.) 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.
8. Contractor shall maintain perennials as follows:
 - a. Before Final Acceptance:
 - 1.) Water, weed, mulch and treat for insect infestations, as necessary.
 - 2.) Fertilize perennials with a slow-release fertilizer, unless a timed-release fertilizer has been incorporated during plant installation. No more fertilizer need be applied during the first growing season.
 - b. After the first growing season
 - 3.) Fertilize perennials with a slow-release fertilizer or any 50% organic fertilizer, or mulch perennials with compost 1" deep.
 - 4.) 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.
 - 5.) Mulch perennial bed once, in early spring, at 1/2" to 1" depth. If soil is bared in late fall, re-mulch lightly after ground is frozen to protect perennials.
9. **One year after planting**, tree stakes and wires or webbing must be removed and tree pits shall be weeded and mulched. If trees require straightening, tree stakes shall be re-set.
10. Trees determined not acceptable shall be replaced to original specifications, during the next planting season. Substitution requests must be submitted in writing to, and be approved by, the Landscape Architect. All tree stakes and guying materials shall be removed.

PART 4 PAYMENT

4.01 Borrow Topsoiling (Onsite source)

Burlington County Department of Resource Conservation

- A. **Quantity:** The quantity for which payment will be made for striping, testing, amending, supplementing, and placing borrow topsoil as necessary to complete the work as shown on the plans or as directed by the Landscape Architect or Engineer.
- B. **Payment:** Payment will be made for the work described above, at the price in the Proposal for the Item Borrow Topsoiling (Onsite), which price shall include the cost required for all activities described herein, including striping, providing and testing materials, amendments, any supplemental topsoil, all materials, adjustment of subgrade elevations to accommodate topsoil depth, resspreading, labor, equipment and all else necessary therefore and incidental thereto.

4.02 Ornamental Trees

4.03 Shade Trees

- A. **Quantity:** The quantities for which payment will be made is the unit price covering all of the work as shown on the plans or as directed by the Landscape Architect or Engineer.
- B. **Payment:** Payment will be made for the quantities as above determined, at the unit or lump sum prices bid in the Proposal for the item LANDSCAPING, which price shall include the cost of soil preparation, planting and maintaining the plantings, restoration where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.04 Lawn Seeding

- A. **Quantity:** The quantities for which payment will be made is a lump sum covering all of the work as shown on the plans or as directed by the Landscape Architect or Engineer.
- B. **Payment:** Payment will be made for the quantities as above determined, at the lump sum prices bid in the Proposal for the item LAWN SEEDING, which price shall include the cost of soil preparation, planting, and maintaining the plantings, restoration of disturbed areas where necessary, all materials, labor, equipment and all else necessary therefore and incidental thereto.

4.05 Plant Bed Preparation

- A. **Payment:** No separate payment shall be made for plant bed preparation which includes removing of existing lawn, soil preparation and amendments, and mulching as described in this this specification section. Payment for work included shall be included in the various bid items from the work described in this specification section, including various planted items when planting is provided by Contractor and Site Clearing where beds are not planted by the contractor.

END OF SECTION 329000 PLANTING, SEEDING & SODDING