INFORMAL CONTRACT
FOR

MTB IT Department
HVAC Replacement

Port of Wilmington
NCSPA Contract No. C-1189(W)
NCSPA Project No. 10438
SCO ID # 18-19916-01A

July 2020

BID SET

2202 Burnett Blvd.
Wilmington, NC 28401

OFFICE 910.251.5673
WEB www.ncports.com

Project Documents
NCSPA Project Number: 10438

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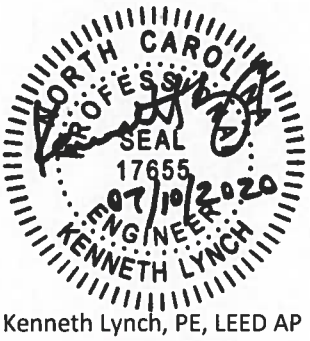
MARITIME BUILDING IT DEPARTMENT HVAC REPLACEMENT
NORTH CAROLINA STATE PORTS AUTHORITY
PORT OF WILMINGTON
NCSPA Contract No. C-1189(W)
NCSPA Project No. 10438
SCO ID #18-19916-01A

Mechanical (Division 23)
Cheatham and Associates, PA
3412 Enterprise Drive
Wilmington, North Carolina 28405
NC License No. C-1073
Contact: Kenneth Lynch, PE, LEED AP
Phone: (910) 452-4210
Fax: (910) 452-4211
E-Mail: klynch@cheathampa.com

Electrical (Division 26)
Cheatham and Associates, PA
3412 Enterprise Drive
Wilmington, North Carolina 28405
NC License No. C-1073
Contact: Mark A. Ciarrocca, PE
Phone: (910) 452-4210
Fax: (910) 452-4211
E-Mail: mciarrocca@cheathampa.com

Architectural (Divisions 05 & 07)
Sawyer Sherwood & Associate Architecture
124 Market Street
Wilmington, NC 28401
NC License No. 52349
Contact: Douglas Sherwood, AIA
Phone: (910) 762-0892
Email: doug@s2a3.com



Kenneth Lynch, PE, LEED AP
Mechanical

Mark A. Ciarrocca, PE
Electrical

Douglas Sherwood, AIA
Architectural

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For

MARITIME BUILDING IT DEPARTMENT HVAC REPLACEMENT
NORTH CAROLINA STATE PORTS AUTHORITY
PORT OF WILMINGTON
NCSPA Contract No. C-1189(W)
NCSPA Project No. 10438
SCO ID #18-19916-01A

CONTRACT DOCUMENTS

Informal Contract and General Conditions
Supplementary General Conditions
Bid Acceptance Form
Form of Performance Bond
Form of Payment Bond
Sheet for Attaching Power of Attorney
Sheet for Attaching Insurance Certificates
Identification of Hub Certified/Minority Business Participation
NCSPA Facility Access Requirements

DIVISION 01 – GENERAL REQUIREMENTS

011000 Summary
011400 Work Restrictions
012900 Payment Procedures
013100 Project Management and Coordination
013300 Submittal Procedures
014000 Quality Requirements
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024119 Selective Demolition

DIVISION 03 – CONCRETE

033000 Cast-in-Place Concrete

DIVISION 05 – METALS

055000 Metal Fabrications

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

074213.19 Insulated Metal Wall Panels

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

230500 Heating and Air Conditioning
230900 Instrumentation and Control for HVAC

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260000 Electrical, Basics
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262416 Panelboards
262816 Enclosed Switches & Circuit Breakers
263600 Transfer Switches

APPENDIX

Appendix A: NCSPA Hot Work Permit Procedures

INFORMAL CONTRACT
AND GENERAL CONDITIONS

FOR

Installation of MTB IT Department HVAC Replacement
Port of Wilmington
NCSPA Contract No. C-1189(W)
NCSPA Project No. 10438
SCO ID No. 18-19916-01A

SCOPE OF WORK

Furnish and install all materials, labor, equipment, and incidentals for the complete and proper installation of the Maritime Building IT Department HVAC Replacement project located on the North Carolina State Ports Authority property at the Port of Wilmington. Work consists of demolition and removal of existing HVAC units including main split system and thru-wall backup units and furnishing and installing new computer room air conditioning units, ATS and window infill.

NOTICE TO BIDDERS

Sealed bid for this work will be received by:

Barry Addertion, P.E.
North Carolina State Ports Authority
North Carolina Maritime Building
2202 Burnett Blvd.
Room 100A
Wilmington, NC 28401
Phone No.: (910) 251-5673

up to **3:00 PM,** on **August 13, 2020** and immediately thereafter publicly opened and read aloud. Complete plans and specification and contract documents can be obtained from

Engineering and Maintenance Department
North Carolina State Ports Authority
2202 Burnett Blvd.
Wilmington, NC 28401
Phone No.: (910) 251-5673
Email: barry_addertion@ncports.com

Contractors are hereby notified that they must have proper license under the State laws governing their respective trades and that North Carolina General Statute 87 will be observed in receiving and awarding contracts. General Contractors must have general license classification for **"Mechanical - Heating Group 2" or "Unclassified".** All subcontractors are hereby notified that they must be licensed with North Carolina General Statute, Chapter 87, governing their respective trades.

A bid bond is not required for this project. A performance bond and payment bond are required for this contract.

No bid may be withdrawn after the opening of bids for a period of 60 days. The Owner reserves the right to reject any or all bids and waive informalities. Bids shall be made only on the BID/ACEPTANCE form provided herein with all blank spaces for bids properly filled in and all signatures properly executed.

Please note on the envelope:

Bid Proposal: Attn: Barry Addertion, PE
Subject: Installation of MTB IT Department HVAC Replacement
Bid Date: _____
Contractor: _____
License Number: _____

An open pre-bid meeting will be held for all interested bidders and vendors on **July 30 , 2020** at 10:00 AM in the Engineering Department Conference Room at the Maritime Building, 2202 Burnett Blvd., Wilmington, North Carolina 28401. Attendance at the Pre-Bid meeting is not mandatory, but all Bidders should attend this conference and/or visit the site in order to acquaint themselves with site conditions and job requirements. Last day for contractor questions is **August 6, 2020** by close of business.

The Owner reserves the unqualified right to reject any or all bids and waive informalities.

GENERAL CONDITIONS

1. GENERAL

a. It is understood and agreed that by submitting a bid that the Contractor has examined these contract documents, drawings and specifications and has visited the site of the Work, and has satisfied himself relative to the Work to be performed.

2. DEFINITIONS

a. **Owner:** "Owner" shall mean, North Carolina State Ports Authority.

b. **Contractor**: "Contractor" shall mean the entity that will provide the services for the Owner.

c. **Designer**: The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer responsible for preparing the project plans and specifications. They will be referred to hereinafter as if each were of the singular number, masculine gender.

d. **Contract Documents:** "Contract Documents" shall consist of the Notice to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the bid; the contract; the performance bond if applicable; and insurance certificates. All of these items together form the contract.

3. INTENT AND EXECUTION OF DOCUMENTS

a. The drawings and specifications are complementary, one to the other. That which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a complete job. In case of discrepancy or disagreement in the Contract Documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.

b. In such cases where the nature of the work requires clarification by the Designer/ Owner, the Designer/ Owner shall furnish such clarification. Clarifications and drawings shall be consistent with the intent of the Contract Documents, and shall become a part thereof.

4. AS-BUILT MARKED-UP CONSTRUCTION DOCUMENTS

a. Contractor shall provide one complete set of legible "as-built" marked-up construction drawings and specifications recording any and all changes made to the original design during the course of construction. In the event no changes occurred, submit construction drawings and specifications set with notation "No Changes." The Designer/Owner must receive "As-built" marked-up construction drawings and specifications before the final pay request can be processed.

5. SUBMITTAL DATA

a. The Contractor awarded the contract shall submit all specified submittals to the Owner/Designer. A minimum number of copies as specified by the owner, of all required submittal data pertaining to construction, performance and general dimensional criteria of the components listed in the technical specifications shall be submitted. No material or equipment shall be ordered or installed prior to written approval of the submittals by the Designer/Owner. Failure to provide submittal data for review on equipment listed in the technical specifications will result in removal of equipment by the Contractor at his expense if the equipment is not in compliance with the specifications.

6. SUBSTITUTIONS

a. In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until five (5) days prior to the receipt of bids or by the date specified in the pre bid conference, when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

b. Submittals for proposed substitutions shall include the following information:

1. Name, address, and telephone number of manufacturer and supplier as appropriate.

2. Trade name, model or catalog designation.

3. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.

4. Detailed comparison with specified products including performance capabilities, warranties, and test results.

5. Other pertinent data including data requested by the Designer to confirm product equality.

c. If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum***.***

7. WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

a. The contractor shall maintain, in readable condition at his job site one complete set of working drawings and specifications for his work including all shop drawings. Such drawings and specifications shall be available for use by the owner, designer or his authorized representative.

b. The contractor shall maintain at the job site, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings

by the contractor and submitted to the designer upon project completion and no later than 30 days after acceptance of the project.

8. MATERIALS, EQUIPMENT, EMPLOYEES

a. The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, fuel, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.

b. **All materials shall be new and of quality specified**, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.

c. Upon notice, the contractor shall furnish evidence as to quality of materials.

d. No changes shall be made in the Work except upon written approval and change order of the Designer/Owner. Change orders shall be subject to the provisions in the current North Carolina Construction Manual. Revisions required due to changes made by the Contractor without prior approval will be at the Contractors expense.

e. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; the designer prior to the opening of bids shall make such approval or disapproval. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the Owner and Owner approves.

f. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the Owner or if any workman be considered detrimental to the work, the Contractor shall order such parties removed immediately from the work site and property.

g. The Contractor shall cooperate with the Owner in coordinating construction activities.

h. The Contractor shall maintain qualified personnel and effective supervision at the site at all times during the project, and exercise the appropriate quality control program to ensure compliance with the project drawings and specifications.

i. The Contractor shall designate a qualified Foreman/Superintendent who shall direct the work and be present at all times during construction.

9. CODES, PERMITS AND INSPECTIONS

a. The Contractor shall obtain the required permits, if required, give all notices, and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the Contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Designer in writing. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the Owner, he shall bear all cost arising there from.

b. All work under this contract shall conform to the current North Carolina Building Code and other state and national Codes as are applicable.

c. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to county or municipal building codes and may* not be subject to inspection by County or Municipal Authorities. The Contractor shall, however, cooperate with the County or Municipal Authorities by obtaining building permits. Permits shall be obtained at no cost to the Owner.

*****Inspection and certification of compliance by Local Authorities is necessary if an architect or engineer was not employed on the project, or if the plans and specifications were not approved and the construction inspected by the State Construction Office.

10. PROTECTION OF WORK, PROPERTY, THE PUBLIC AND SAFETY

a. The contractors shall be responsible for the entire site and the building and/or construction of the same and provide all the necessary protections, as required by the by laws or ordinances governing such conditions and as required by the Owner and Designer. Contractor shall be responsible for any damage to the Owner's property or that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any claims against the Owner arising from such damages.

b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.

c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the Designer and Owner.

d. The Contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building tree protection around them. He shall barricade all walks, roads, etc., as directed by the Designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.

e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work. Fall protection and all required safety measures for elevated roof is to be provided. Contractor is responsible for safety of all persons on the job site.

f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

g. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage. Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 13(b).

h. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

11. SUBCONTRACTS AND SUBCONTRACTORS

a. The Contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The Contractor agrees that no contractual relationship exists between the subcontractor and the Owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the Contractor.

12. CONTRACTOR-SUBCONTRACTOR RELATIONSHIPS

a. The Contractor agrees that the terms of these Contract Documents shall apply equally to each Subcontractor as to the Contractor, and the Contractor agrees to take such action as may be necessary to bind each Subcontractor to these terms. The Contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to Contractor-Subcontractor relationships. The Owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

13. CHANGES IN THE WORK AND CLAIMS FOR EXTRA COST

a. The Owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.

b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order from the Designer, countersigned by the Owner authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed. Should a claim for extra compensation by the Contractor be denied by the Designer or the Owner, the Contractor may pursue his claim in accordance with G.S. 143-135.3.

c. In the event of emergency endangering life or property, the Contractor may be directed to proceed on a time and material basis whereupon the Contractor shall proceed and keep accurately on such form as specified by the Designer or Owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "d. 1" or Method "d. 2" or both.

d. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:

   1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer and Owner the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except is such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph “d. 2” herein. If neither party elects to proceed under “d. 2”, then unit prices shall apply.

   2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

e. Under Paragraph “d” Method "2" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc.) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc. contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; Under Method "d. 1", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "2" and Paragraph (d) above, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.

f. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:

1. The actual costs of materials and supplies incorporated or consumed as part of the work;
2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker's compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;
3. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;
4. The actual costs of premiums for bonds, insurance, permit fees and sales or use taxes related to the work.
5. Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the Owner.

g. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.

h. Change orders shall be submitted by the contractor in writing to the owner/designer for review and approval. The contractor will provide such proposal and supporting data in suitable format. The Designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the Contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the Contractor's accepted proposal including all supporting documentation required by the Designer**,** the Designer shall prepare the change order and forward to the Contractor for his signature or otherwise respond, in writing, to the Contractor's proposal. Within seven (7) days after receipt of the change order executed by the Contractor, the Designer shall, certify the change order by his signature, and forward the change order and all supporting data to the Owner for the Owner's signature. The Owner shall execute the change order**,** within seven (7) days of receipt.

i. At the time of signing a change order, the contractor shall be required to certify as follows:

> "I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

j. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.

k. If, during the progress of the work, the Owner requests a change order and the Contractor's terms are unacceptable, the Owner**,** may require the Contractor to perform such work on a time and material basis whereupon the Contractor shall proceed and keep accurately on such form as specified by the Designer or Owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph e. above and "net cost" and "cost" per paragraph f. above. Without prejudice, nothing in this paragraph shall preclude the Owner from performing or to have performed that portion of the work requested in the change order.

14. ANNULMENT OF CONTRACT

a. If the Contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the Contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the Owner may give notice in writing, sent by certified mail, return receipt requested, to the Contractor and his Surety (if applicable) of such delay, neglect or default, specifying the same, and if the Contractor within a period of fifteen (15) days after such notice shall not proceed in accordance therewith, then the Owner shall, declare this contract in default, and, thereupon, the Surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the Contractor, or the Surety (if applicable) shall fail to take over the work to be done under this contract within fifteen (15) days after being so notified and notify the Owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the Owner shall have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said Contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and provisions thereof or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the Owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said Contractor and Surety (if applicable). In case the expense so incurred by the Owner shall be less than the sum which would have been payable under the contract, if it had been completed by said Contractor, then the said Contractor and Surety (if applicable) shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the Contractor and the Surety (if applicable) shall be liable and shall pay to the Owner the amount of said excess.

15. TERMINATION FOR CONVENIENCE

a. Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience, after notification to the Contractor in writing via certified mail. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

b. Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as approved by Owner; (3) plus fair and reasonable sums for overhead and profit on work completed. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

16. OWNER'S RIGHT TO DO WORK

a. If, during the progress of the work or during the period of guarantee, the Contractor fails to prosecute the work properly or to perform any provision of the contract, the Owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the Contractor from the Designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the Contractor, such action and cost of same having been first approved by the Designer. Should the cost of such action of the Owner exceed the amount due or to become due the Contractor, then the Contractor or his Surety, or both, shall be liable for and shall pay to the Owner the amount of said excess.

17. INVOICES FOR PAYMENT

a. Contractor shall refer to the Supplemental General Conditions for specific directions on payment schedule, procedures and the name and address where to send applications for payments for this project. It is imperative that invoices be sent only to the above address in order to assure proper and timely delivery and handling.

b. No partial payment will be made unless agreed to in advance. Final payment will be made lump sum within forty-five (45) consecutive days after acceptance of the work and the submission of notarized Contractor's affidavit and four copies of invoices which are to include the Contract, account and job order numbers.

c. The Contractor's affidavit shall state: "This is to certify that all costs of materials, equipment, labor, subcontracted work, and all else entering into the accomplishment of this contract, including payrolls, have been paid in full."

d. Executed Contract Documents, insurance certifications and, upon completion and acceptance of the work, invoices and other information requested are to be sent to:

Barry Addertion, P.E.
North Carolina State Ports Authority
Engineering and Maintenance Department
2202 Burnett Boulevard
Wilmington, NC 28401
Phone No.: (910) 251-5673
Fax No.: (910) 251-5686
Email: barry_addertion@ncports.com

e. It is imperative that Contract Documents, invoices, etc. be sent only to the above address in order to assure proper and timely delivery and handling.

18. MINIMUM INSURANCE REQUIREMENTS

a. The work under this contract shall not commence until the Contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the Owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the Owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

1. Worker's Compensation and Employer's Liability

The Contractor shall provide and maintain, until final acceptance, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of $100,000.

2. Public Liability and Property Damage

The Contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily 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 the Contractor or by any Subcontractor, or by anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

Bodily Injury:	$500,000 per occurrence
Property Damage:	$100,000 per occurrence / $300,000 aggregate

In lieu of limits listed above, a $500,000 combined single limit shall satisfy both conditions.

Such coverage for completed operations must be maintained for at least two (2) years following final acceptance of the work performed under the contract.

3. Property Insurance (Builder's Risk/Installation Floater)

The Contractor shall purchase and maintain property insurance until final acceptance, upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, the Subcontractors and Sub-subcontractors in the work and shall insure against the perils of fire, wind, rain, flood, extended coverage, and vandalism and malicious mischief. If the Owner is damaged by failure of the contractor to purchase or maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto; the Contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so includes such portions.

4. Deductible

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the Contractor.

5. Other Insurance

The contractor shall obtain such additional insurance as may be required by the owner or by the General Statutes of North Carolina including motor vehicle insurance, in amounts not less than the statutory limits.

6. Proof of Carriage

The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurance required before written approval is granted by the Owner.

19. CLEANING UP AND RESTORATION OF SITE

a. The Contractor shall keep the sites and surrounding area reasonably free from rubbish at all times and shall remove and legally dispose of debris off site on a daily basis or when directed to do so by the Owner. Before final inspection and acceptance of the project, the Contractor shall thoroughly clean the site, and completely prepare the project and site for use by the Owner.

b. At the end of construction, the contractor shall oversee and implement the restoration of the construction site to its original state. Restoration includes but not limited to walks, drives, lawns, trees and shrubs, corridors, stairs and other elements shall be repaired, cleaned or otherwise restored to their original state.

20. GUARANTEE

a. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the final acceptance of the work and shall replace such defective materials or workmanship without cost to the owner.

b. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.

c. Additionally, the Owner may bring an action for latent defects caused by the negligence of the Contractor, which is hidden or not readily apparent to the Owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

d. Guarantees for roofing workmanship and materials shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

21. TAXES

a. Federal excise taxes **do not** apply to materials entering into state work (Internal Revenue Code, Section 3442(3)).

b. Federal transportation taxes **do not** apply to materials entering into state work (Internal Revenue Code, Section 3475(b) as amended).

c. North Carolina sales tax and use tax, as required by law, **do apply** to materials entering into state work (N.C. Sales and Use Tax Act, Regulation No. 42), and such costs shall be included in the bid proposal and contract sum.

d. Local option sales and use taxes, as required by law, **do apply** to materials entering into state work as applicable (Local Option Sales and Use Tax Act, Regulation No. 57) and such costs shall be included in the bid proposal and contract sum.

e. Accounting Procedures for Refund of County Sales & Use Tax

Amount of county sales and use tax paid per contractor's statements:

1. Contractors performing contracts for <u>state owned agencies</u> shall give the state agency for whose project the property was purchased a signed statement containing the information listed in G.S. 105-164.14(e).

2. The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement as of April 1, 1991 from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

3. In the event the contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

4. Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

5. When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

6. Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of county sales or use tax paid thereon by the contractor.

7. Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.

8. Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

22. EQUAL OPPORTUNITY CLAUSE

a. The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

b. The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

23. MINORITY BUSINESS PARTICIPATION

a. GS 143-128.2 establishes a ten percent (10%) goal for participation by minority business in total value of work for each State building project.

b. For construction contracts with a value of less than $300,000, the Owner has the responsibility to make a good faith effort to solicit minority bids and to attain the goal. The contractor shall include with his bid a completed Identification of HUB Certified/Minority Business Participation form. Contractor shall submit completed Appendix E MBE Documentation for Contract Payments form with final payment request.

24. ACCESS TO PERSONS AND RECORDS

a. The State Auditor shall have access to persons and records as a result of all contracts or grants entered into by the Owner in accordance with General Statute 147-64.7. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for lost efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

25. GOVERNING LAWS

This contract is made under and shall be governed by and construed in accordance with the laws of the State of North Carolina. The Contractor shall comply with all applicable federal, State and local laws, statutes, ordinances and regulations including, but not limited to, the Omnibus Transportation Act of 1991 and its implementing regulations.

END OF INFORMAL CONTRACT AND GENERAL CONDITIONS

SUPPLEMENTARY GENERAL CONDITIONS

1. TIME OF COMPLETION

a. The Contractor shall commence work to be performed under this Contract on a date to be specified in written order from the Designer/Owner and shall fully complete all work hereunder within **150** consecutive calendar days from the Notice to Proceed. For each day in excess of the above number of days, the Contractor shall pay the Owner the amount of **Five Hundred and 00/100 Dollars ($500.00)** as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the Owner should the Contractor fail to complete the Work within the time specified.

b. If the Contractor is delayed at any time in the progress of his work by any act or negligence of the Owner, his employees or his separate contractor, by changes ordered in the work; by abnormal weather conditions; by any causes beyond the Contractor's control or by other causes deemed justifiable by Owner, then the contract time may be reasonably extended in a written order from the Owner upon written request from the contractor within three days following the cause for delay. Time extensions for weather delays, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the Owner or its agents.

2. PERFORMANCE AND PAYMENT BONDS

a. Contractor shall furnish a Performance Bond and Payment Bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications (Forms 307 & 308). An authorized agent of the bonding company who is licensed to do business in North Carolina shall countersign all bonds.

END OF SUPPLEMENTAL CONDITIONS

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BID ACCEPTANCE FORM
FOR
Maritime Building IT Department HVAC Replacement
North Carolina State Ports Authority
Port of Wilmington
NCSPA Contract No. C-1189(W)
NCSPA Project No. 10438
SCO ID #18-19916-01A

CONTRACTOR'S NAME & LICENSE NUMBER: _____

We are in receipt of the following Addendum: No. 1 _____, No. 2 _____, No. 3 _____

The undersigned, as bidder, proposes and agrees if this bid is accepted to contract with the State of North Carolina through the North Carolina Ports Authority for the furnishing of all materials, equipment, and labor necessary to complete the construction of the work described in these documents in full and complete accordance with plans, specifications, and contract documents, and to the full and entire satisfaction of the State of North Carolina and the North Carolina Ports Authority for the sum of:

BASE BID - SINGLE PRIME CONTRACT:

Installation of MTB IT Department HVAC Replacement

TOTAL GENERAL CONSTRUCTION CONTRACT BASE BID:

_____ **($ _____) Dollars.**

Provide scope associated with the project including the following:

The Contract shall be issued as a lump sum contract for the work shown in the plans and specifications. Any work items above baseline quantities shown will require a change order. Contractor will be required to document quantities of all materials utilized. No changes will be allowed without prior authorized approval. Any general conditions should be included in each line item.

Respectively submitted this _____ day of _____ 2020.

_____
(Contractor's Name)

Federal ID#: _____ By: _____

Witness: _____ Title: _____
(O*wner, partner, corp. Pres. Or Vice President)*

_____ Address: _____
(Proprietorship or Partnership)

Attest: *(corporation)* Email Address: _____

(***Corporate Seal***)

By:_____ License #:_____

Title:_____
(Corporation, Secretary./Ass't Secretary.)

ACCEPTED by the STATE OF NORTH CAROLINA

through the

Total amount of accepted by the owner, included base bid and bid alternates: _____

NORTH CAROLINA STATE PORTS AUTHORITY APPROVAL SIGNATURE

BY: Brian Clark TITLE: Chief Operating Officer

DATE:_____, 2020

NORTH CAROLINA STATE PORTS AUTHORITY APPROVAL COUNTER SIGNATURE

BY: Alherd Kazura TITLE: Chief Financial Officer

DATE:_____, 2020

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal:
(Contractor) _____

Name of Surety: _____

Name of Contracting Body North Carolina State Ports Authority

Amount of Bond: $ _____

Project Installation of MTB IT Department HVAC Replacement

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in ___Four (4)____ counterparts.

Witness:

_____

Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

Attest: (Corporation)

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

_____
(Surety Company)

Witness:

By: _____

_____

Title: _____
(Attorney in Fact)

Countersigned:

_____

(Surety Corporate Seal)

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

FORM OF PAYMENT BOND

Date of Contract:	
Date of Execution:	
Name of Principal (Contractor)	
Name of Surety:	
Name of Contracting Body:	North Carolina State Ports Authority
Amount of Bond:	$
Project	Installation of MTB IT Department HVAC Replacement

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in Four (4) counterparts.

Witness:

_____
Contractor: (Trade or Corporate Name)

_____
(Proprietorship or Partnership)

By: _____

Attest: (Corporation)
Title_____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

_____
(Surety Company)

Witness:

By:
_____

_____

Title:
_____
(Attorney in Fact)

Countersigned:

_____

(Surety Corporate Seal)

_____
(N.C. Licensed Resident Agent)

_____

_____
Name and Address-Surety Agency

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

Sheet for Attaching Power of Attorney

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Sheet for Attaching Insurance Certificates

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Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

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North Carolina State Ports Authority
Police Department

FACILITY ACCESS REQUIREMENTS

FACILITY COMPLIANCE

The North Carolina State Ports Authority (NCSPA) marine terminals are federally regulated maritime facilities that must adhere to and enforce the Maritime Transportation Security Act (MTSA) regulations. The NCSPA is fully compliant with the provisions of the MTSA and utilizes the federal Transportation Workers Identification Credential (TWIC) as the primary credential to initiate unescorted access.

FACILITY ACCESS POLICY

1. Individuals with a valid TWIC card will be granted access under the following conditions:
    a. They must have a valid TWIC card in their possession,
    b. They must be able to demonstrate a legitimate reason to enter the port,
    c. They must possess a valid photo government issued identification (i.e. driver's license),
    d. They must register in the NCSPA Access Control System by obtaining a Port Access Card.
2. Individuals with a payment receipt, or an enrollment email confirmation showing that they have applied for their initial or first TWIC card will be allowed escorted access for thirty (30) consecutive calendar days.
3. Individuals with a payment receipt, or an enrollment email confirmation showing that they have applied for a renewal of their TWIC card will be granted unescorted access for thirty (30) consecutive calendar days provided the payment receipt, or the enrollment email confirmation is dated before the expiration of the original TWIC card.
4. Individuals that have a payment receipt, or an enrollment email confirmation showing that they have reported their TWIC card lost, stolen or damaged will be granted thirty-seven (37) consecutive calendar days of unescorted access provided the individual was previously enrolled in the NCSPA Access Control System.
5. Individuals without a valid TWIC (Non-TWIC Holders) will be granted access under the following conditions:
    a. Individuals without a TWIC who regularly access NCSPA facilities must obtain a Port Access Card upon their first visit to any NCSPA facility. Regular access is defined as an individual that will access the facility five (5) times in a 365 day period. Regular Access Users include but are not limited to; Port Employees, Port Tenants, Stevedores, Contractors, Longshoremen, Vendors, Truck Drivers, Customers, etc.
    b. Individuals without a TWIC will be granted a maximum of thirty (30) escorted facility visits.
    c. Individuals without a TWIC must apply for their TWIC card before the expiration of their thirtieth (30^{th}) visit.
    d. Individuals without a TWIC must produce a payment receipt, or an enrollment email confirmation before the expiration of their thirtieth (30th) escorted visit. Failure to do so will result in their access to NCSPA restricted or secure areas being denied.
    e. Individuals who have applied for their TWIC card and are waiting for its arrival can present their payment receipt, or the enrollment email confirmation to port police and the individual will be granted an additional thirty (30) consecutive calendar days of escorted access. In the event the individuals TWIC card is delayed beyond thirty (30) days, the individual can present a letter from TSA explaining why their card has been delayed to receive an extension.
    f. Individuals who are denied a TWIC by TSA will not be granted access to any NCSPA restricted or secure areas.

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Specification and drawing conventions.
5. Work sequence.

1.3 PROJECT INFORMATION

A. Project Identification: Installation of MTB IT Department HVAC Replacement, Contract No. C-1178(W), Project No. 10438.

1. Project Location: Port of Wilmington
Installation of MTB IT Department HVAC Replacement
2202 Burnett Blvd.
Wilmington, NC 28401

B. Owner: North Carolina State Ports Authority

1. Owner's Representative: Barry Addertion, P.E.
Project Manager: Barry Addertion, PE
Engineering and Maintenance Department
2202 Burnett Blvd.
Wilmington, NC 28401
Phone No.: (910) 251-5673
Email: barry_addertion@ncports.com

C. Base Bid Work:

1. Demolish and remove existing HVAC units including main split system and thru-wall backup units.
2. Furnish and install new computer room air conditioning units, ATS and window infill.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Furnish all materials, labor, tools, equipment, services, transportation, and supervision necessary to perform all of the work associated with the project.
2. Perform Work of Contract under stipulated sum contract with Owner in accordance with Conditions of Contract.
3. The construction document package will consist of these specifications and all associated drawings. All items in the drawings but not in the specifications or items in the specifications and not in the drawings shall be considered included in the scope of work.
4. Unless stated otherwise within these specifications or contract documents, the Contractor shall make complete submittal of all shop drawings, proposed systems and equipment, including cut-sheets, and technical information, calculations, and other information requested, to the Owner. Submittal of information will be in a timely manner prior to commencement of work on the system represented by the submittal.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Use of Site: Limit use of Project site to work in areas. Do not disturb portions of Project site beyond areas in which the Work is being performed.

1. Limit use of site to allow:

a. Owner occupancy as required.
b. Work by others.
c. Use of site by NCSPA authorized users.

2. Construction operations: The Contractor shall provide lights, barricades, and warning signs as necessary to protect the required construction area. The Contractor shall coordinate, with the NCSPA's representative, the area required for construction purposes. An area for the Contractor's field office if required and/or material storage shall be coordinated with the Owner.

1.6 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Final Acceptance of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.8 WORK SEQUENCE

A. Construct work in stages during construction period in accordance with the drawings and as required to maintain a safe working environment. Coordinate construction schedule and operations with Owner to minimize interference with the operations. The Contractor shall coordinate with NCSPA to obtain access to the site and provide a minimum agreed advance notice before accessing the work area and requesting any utility outages.

B. The Contractor shall submit a timeline that shows all work to be performed and the areas of the port that will be affected during each phase of construction. The Contractor must present this timeline to the Owner for approval prior to the commencement of any work. Any deviations from the approved timeline shall be promptly brought to the attention of the Owner. The Owner will make all efforts to accommodate this timeline, but maintaining the smooth operation of the port will be the highest priority.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 011400 – WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 COOPERATION AND COORDINATION WITH NCSPA OPERATIONS

A. Portions of the terminal will be in use during this Contract requiring that the Contractor closely coordinate his work with the Owner to minimize interference with the Operations and other contractors performing work on behalf of the NCSPA. The Contractor shall coordinate with the NCSPA to obtain access to the site and provide a minimum agreed advance notice before accessing the work area and requesting any utility outages. Area is active for truck operations. Contractor is to provide all temporary traffic control and safety barriers required to complete construction.

B. The Contractor is responsible for the coordination and protection of his work until acceptance by the Owner.

C. The Contractor shall submit a timeline that shows all work to be performed and the areas of the site that will be affected during each phase of the construction. The Contractor must present this timeline to the Owner for approval prior to the commencement of any work. Any deviations from the approved timeline shall be promptly brought to the attention of the Owner. The Owner will make all efforts to accommodate this timeline but maintaining the smooth operation of the Port will be the highest priority.

1.3 CONSTRUCTION AREA

A. The Contractor shall provide lights, barricades, and warning signs as necessary to protect the required construction area. The Contractor shall coordinate with the NCSPA's representative, the area required for construction purposes. An area for the Contractor's field office and/or material storage shall be coordinated with the Owner.

1.4 SAFETY

A. The Contractor shall assign a safety officer to the Project for its duration. At a minimum, the Safety Officer shall be physical present at the Port for the complete time period from the commencement of the work through commissioning, certifications and placement into the NCSPA operations. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

B. Contractor is responsible for adhering to the Port Safety Plan and is to wear appropriate and required PPE at all times.

1.5 OTHER CONTRACTS AND OWNER'S OPERATIONS

A. The Owner or other Contractors may have operations underway at or near the site of work under this contract. The Contractor shall fully cooperate with the Owner's work forces or other contractors and shall adapt his scheduling and performance of the work under this Contract to accommodate the other work and shall heed any directions that may be provided by the Owner. The Contractor shall not commit, nor permit, any act that will interfere with the performance of work by other contractors or the Owner.

1.6 FACILITIES SECURITY

A. The Contractor and his personnel will comply with the security regulations of the Owner. The Contractor's employees working on NCSPA property may be required to attend a Port Security Training Class as required by the current Maritime Security Act.

B. Port access badge is required for all personnel coming on site. Cost of badge is $20.00. Badge can be obtained from the Port of Morehead City Police Station located in the Maritime Building or at the Port of Wilmington Badge Office in the Material Management Building.

1.7 TRANSPORTATION WORKER IDENTIFICATION CREDENTIAL (TWIC) PROGRAM

A. Controlling access to certain maritime facilities is a critical component of the Department of Homeland Security's (DHS) efforts to enhance port security. A TWIC is a federally-mandated common identification credential for all personnel requiring unescorted access to secure areas of regulated maritime facilities; these regulated facilities include both NCSPA port terminals.

B. The Transportation Security Administration (TSA) issues TWICs. TWIC enrollment centers are located in both Wilmington and Morehead City. A thorough background check is made by TSA prior to issuance of a TWIC. The cost of a TWIC is $125.25 per person or as defined by the Transportation Security Administration. It is valid for 5 years. For additional information, confirmation of cost, or enrollment procedures, please visit https://universal enroll.dhs.gov/.

C. Contractor and Vendors are responsible for compliance by all individuals requiring access to the Ports on behalf of the Contractor/Vendor to perform the contracted work, including but not limited to employees, agents, subcontractors, and suppliers.

D. Contractors/Vendors shall be in compliance with all TWIC requirements prior to initiating contracted work.

E. The Contractor/Vendor is responsible for all costs associated with obtaining a TWIC.

F. Under the current program, an individual with a valid TWIC may escort a total of five other individuals for a limited number of visits. See provided Facility Access requirements. Requirements are subject to change and contractor is responsible for adhering to any changed conditions.

G. Violations of any TWIC regulation may result in the removal of the individual from NCSPA property. No extension of time for completion of the contract will be allowed if this occurs. Any

fines that are charged to the North Carolina State Ports Authority as a result of the actions of the Contractor/Vendor may be subject to reimbursement by the Contractor/Vendor.

1.8 UTILITIES

A. The Contractor will be responsible for furnishing, at his own expense, all necessary utilities and electrical power, including utility connections, and restroom facilities. Contractor may be allowed access to potable water. Transportation, connections onto system, and storage of water is at Contractor's expense.

1.9 EXISTING WORK

A. The Contractor shall protect existing work which is to remain in place, be reused, or remain the property of the North Carolina State Ports Authority. Repair items which are to remain and which are damaged during performance of the work to their original condition.

1.10 USE OF SITE

A. The Contractor's use of the site may be restricted. Work hours may be limited. Parking permits may be required.

END OF SECTION 011400

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Owner in duplicate within 15 days after date established in Notice to Proceed.
3. Include within each line item direct proportional amount of Contractor’s overhead and profit.
4. Revise schedule to list approved Change Orders, with each Application for Payment

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Owner's project number.
c. Contractor's name and address.
d. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703 or other approved form.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
        1) Labor.
        2) Materials.
        3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Payment for items stored off-site are not allowed unless approved by Owner.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
    b. Identify site mobilization, bonds, and insurance.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Owner by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G703 as form for Applications for Payment or approved alternative.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored on-site, but not yet installed. Off-site stored materials will not be accepted unless approved in advance by Owner.

G. Retainage: Retain 5% of completed and stored to date contract amount for each pay application.

H. Transmittal: Submit two signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule.

4. Products list.
5. Schedule of unit prices.
6. Submittal schedule.
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Owner issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Roof Plans: Show structural elements. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
3. Review: Owner will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Owner determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Owner will so inform Contractor, who shall make changes as directed and resubmit.
4. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.

2. File Preparation Format: 2015 .DWG, operating in Microsoft Windows operating system or Portable Date File (PDF) format.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Owner will return RFIs submitted to Owner by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Designer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Owner.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Owners Action: Owner will review each RFI, determine action required, and respond. Allow five working days for Owner's response for each RFI. RFIs received by Owner after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.

d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Owner's action may include a request for additional information, in which case Owner's time for response will date from time of receipt of additional information.
3. Owner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to contract.

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing at the time of the RFI submission or within 5 days of RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. RFI number including RFIs that were returned without action or withdrawn.
4. RFI description.
5. Date the RFI was submitted.
6. Date Owner's response was received.

F. On receipt of Owner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner within five days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site as required.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, but no later than **10** days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.

2. Attendees: Authorized representatives of Owner; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Coordination Meetings: Conduct project coordination meetings as required.

1. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction

schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, construction photographs, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Owner's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 20 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Owner’s final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Owner for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:
    a. Project name.
    b. Date.
    c. Name of Construction Manager.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number, numbered consecutively.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

E. Options: Identify options requiring selection by Owner.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner on previous submittals, and deviations from requirements in the

Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Owner's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Paper Submittals: Place a permanent label or title block on each submittal item for identification. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Owner observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

    a. Submit one paper copy and one electronic copy of submittal to Owner and Designer. Owner and Designer will scan and electronically return review comments. If hard copy response is preferred, provide an additional hard copies.

2. Indicate name of firm or entity that prepared each submittal on label or title block.
3. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Owner.
4. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner will discard submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Architect.
6) Name of Construction Manager.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.
15) Indication of full or partial submittal.
16) Transmittal number, numbered consecutively.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

6. Action Submittals: Submit one electronic PDF copy and one paper copy of each submittal unless otherwise indicated. Owner will return comments electronically.
7. Informational Submittals: Submit one electronic PDF copy and one paper copies of each submittal unless otherwise indicated. Owner will not return copies.
8. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

a. PDF electronic file.
b. One paper copies of Product Data unless otherwise indicated. Owner will return comments electronically.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:

    a. One opaque (bond) copies of each submittal.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit one sets of Samples.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least one sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

a. PDF electronic file.
b. One paper copies of product schedule or list unless otherwise indicated.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER’S ACTION

A. Action Submittals: Owner will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Owner will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Owner without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Owner or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Owner.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of ten previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Contractor's quality-control personnel.

B. Qualification Data: For testing agency.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

1.7 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Owner before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on shop drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

H. Testing Responsibilities: Where quality-control services are indicated as Contractor is to engage a qualified testing agency to perform these services.

1. Contractor will furnish Owner with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform. Testing agency is to be submitted to Owner for review and approval. Contractor is to pay for services.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

I. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

J. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.
7. May not approve or accept any portion of the work.
8. Has no authority to stop the work.

K. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

L. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.
2. Notify Owner and Testing Agency 24 hours prior to expected time for operations requiring services.

M. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Owner before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified **testing agency** as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Owner and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Owner with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Controls: Enclosures.

B. Temporary HVAC.

1.02 INTERIOR ENCLOSURES

A. Provide temporary partitions to separate work area from Owner-occupied area, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

C. See Phasing/Sequencing/Protection of Work on Drawing M0.01 for additional notes and requirements.

1.03 TEMPORARY HVAC

A. See Drawings M0.01, M1.01 and M1.02 for requirements for temporary HVAC for the IT Space Computer Room 221.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Owner of locations and details of cutting and await directions from Owner before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Owner according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner promptly.

B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and

electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that

adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.
2. Allow for structure movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean features before applying paint or other finishing materials.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner’s signature for receipt of submittals.

5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
4. Advise Owner of changeover in heat and other utilities.
5. Participate with Owner in conducting inspection and walkthrough with appropriate parties.
6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
7. Complete final cleaning requirements, including touchup painting.
8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use electronic form approved by Owner.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest level to highest level.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Owner.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Owner will return annotated file.
    b. PDF electronic file. Owner will return annotated file.

c. One paper copy.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average industrial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Remove labels that are not permanent.
    j. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

    1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
    2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

        a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

    3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Final Submittal:

1) Submit PDF electronic files of scanned record prints and one paper-copy set of file prints.
2) Owner will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Accurately record information in an acceptable drawing technique.
b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.
d. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Changes made by Change Order or Construction Work Change Directive.
    d. Changes made following Owner's written orders.
    e. Details not on the original Contract Drawings.
    f. Field records for variable and concealed conditions.
    g. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Final Acceptance, review marked-up record prints with Owner. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Scanned annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Owner for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Owner.
    e. Name of Contractor.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Owner's reference during normal working hours.

END OF SECTION 017839

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SECTION 024119 -SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements.
2. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor’s property and shall be removed from the site with further disposition at the Contractor’s option.

1.5 INFORMATIONAL SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of site and of Owner's partial occupancy of completed Work.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

C. Manufacturer’s product data for all repair materials used.

D. Pre-demolition Photographs or Video: Submit before Work begins.

E. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner assumes no responsibility for actual condition of elements to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Designer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are to be selectively demolished.

1. Notify Designer if hazardous materials are found on site that were not previously identified in the contract documents.
2. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present on site to be selectively demolished.
3. Refer to plans for identification of known hazardous material demolition.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.9 SCHEDULING

A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations. All site demolition activities shall be clearly identified in the project schedule.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials which performance equals or surpasses that of existing materials.
3. All repair materials shall be submitted to the Designer for approval.

2.2 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations. Comply with Owner's procedures for work involving utility shutdowns.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Designer.

E. Engage a professional engineer to perform an engineering survey of condition of surrounding structures to determine whether removing any site element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing site elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.

B. Utility Requirements: Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

C. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of site.

3.3 UTILITY ABANDONMENT AND REMOVAL

A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 12 inches' thick brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.
3. The following pipes shall be abandoned by removal or by filling with grout/flowable fill concrete:

    a. Pipes larger than 24-inch diameter.
    b. Pipes located within roadway section and meeting one of the following conditions:

        1) Pipes that are 12-inches in diameter up to and including pipes that are 24-inches in diameter and are buried less than 20 feet below finished grade.
        2) Pipes that are 6-inches in diameter up to 12-inches that are not cast iron, ductile iron, PVC, or HDPE and are buried less than 12 feet below finished grade.
        3) Pipes located below groundwater table.

B. Abandoned Structures: Remove structure and close open ends of the remaining piping or remove top of structure down to not less than 3 ft. below final grade; fill structure with flowable fill.

C. Removal: Dispose of removed material promptly. On-site storage or sale of removed items is prohibited.

3.4 PREPARATION

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations and Owner.

C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, to prevent pedestrians and/or vehicles from entering work areas and as indicated on the contract drawings.
3. Protect existing site improvements, appurtenances, and plantings to remain as indicated on the contract drawings.
4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain as indicated on the contract drawings.
5. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas. All damage occurring as a result of improper weather protection shall be repaired at Contractor's expense.

D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.5 POLLUTION CONTROLS

A. Use suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.6 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Break up and remove concrete slabs on grade, concrete curbs and gutter, and bituminous roadways, driveways and parking lots, unless otherwise shown to remain.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Contractor is to tag each item and provide inventory of items being stored and list manufacturer name, model number, and applicable information.
6. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Designer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.7 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Saw-cut perimeter of area to be demolished, then break up and remove. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner’s property and legally dispose of them.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.10 PROTECTION OF EXISTING EQUIPMENT

A. The Contractor is to provide a temporary means of protection for existing equipment when demolition activities occur around or within 20 feet of existing or new operational equipment. The temporary means of protection shall be sufficient quality to protect the equipment from weather including rain, snow, ice, etc. The means of temporary enclosures are to be approved by the Owner and Designer.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions, Division 1 through 16 Specification Sections, and Contract Addenda apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:

1. Foundations
2. Ramps
3. Miscellaneous concrete
4. Repair of existing concrete

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories and admixtures.

C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

D. Material Test Reports: The Contractor shall hire a qualified independent testing agency to indicate and interpret test results for compliance of the following with the requirements indicated, based on comprehensive testing of current materials:

1. Laboratory test reports for concrete materials and mix design test.

E. E. Material certificates and laboratory test reports. Material certificates shall be signed by manufacturer and Sub-Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1. Cementitious materials and aggregates for normal weight concrete.

2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Bonding agents.
5. Repair materials.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Testing Service: The Owner will engage a testing agency to perform material evaluation tests and to design concrete mixes. The independent testing agency shall be 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.

C. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Subcontractor's expense.

E. Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

F. Repair all existing damaged concrete per ICRI, International Concrete Repair Institute guidelines including 310.1R-2008, “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion” and repair product manufacturer’s written instructions.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

2. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.

B. Deformed Welded Wire Fabric: ASTM A 497 welded steel wire fabric.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

a. Fly Ash: ASTM C 618, Class F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source for exposed concrete.

1. Nominal maximum aggregate size: 3/4”
2. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to The Designer.

C. Water: Potable and complying with ASTM C94.

D. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent water soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

E. Water-Reducing Admixture: ASTM C 494, Type A.

F. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

G. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

2.4 RELATED MATERIALS:

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9-oz./sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

C. C. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products:

a. Burke by Edoco; Cureseal 1315 WB.
b. ChemMasters; Polyseal WB.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315 WB.
d. Euclid Chemical Company (The); Super Diamond Clear VOX.
e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
f. Lambert Corporation; UV Safe Seal.

g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
h. Meadows, W. R., Inc.; Vocomp-30.
i. Metalcrete Industries; Metcure 30.
j. Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
k. Tamms Industries, Inc.; LusterSeal WB 300.
l. Unitex; Hydro Seal 25.
m. US Mix Products Company; US Spec Radiance UV-25.
n. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2.5 WATERSTOPS

A. Self-Expanding Rubber Hydrophilic Strip Waterstops:

1. Adcor ES by Grace Construction.

B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers:

a. Bometals, Inc.
b. Greenstreak.
c. Meadows, W. R., Inc.
d. Murphy, Paul Plastics Co.
e. Progress Unlimited, Inc.
f. Tamms Industries, Inc.
g. Vinylex Corp.

2. Profile: Ribbed type and three-directional Retrofit type with stainless steel batten bars and stainless steel expansion anchors, as indicated on drawings. Sizes indicated on drawings.

C. Chemical Resistant Waterstops: WESTEC Envirostop Thermoplastic Elastomeric Rubber (TPER/TPV): A fully vulcanized Synthetic rubber with high resistance to wide range of oils, solvents and chemicals, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers:

a. Westec Barrier Technologies, Inc.

2. Profile: Three-directional ribbed retrofit type 630 with stainless steel batten bars and stainless steel expansion anchors, as indicated on drawings.

2.6 PROPORTIONING AND DESIGNING MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to The Designer for preparing and reporting proposed

mix designs. Provide laboratory trial batch results for concrete mix including waterproof admixture.

1. Do not use the same testing agency for field quality control testing.

B. Submit written reports to The Designer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by The Designer.

C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:

1. 5000 psi, 28-day compressive strength; water-cement ratio, 0.40 maximum, 5% +/-1/5% air entrained.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Slabs and equipment pads: Not more than 4 inches.
2. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2 -4 inch slump concrete.
3. Other concrete: Not more than 4 inches.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by The Designer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by The Designer before using in Work.

F. F. Concrete repairs and leveling toppings:

1. For formed repairs use SikaTop 111 Plus or approved equal.
2. For hand applied repair mortars use ‘SikaTop’ or ‘SikaRepair’ mortars per application or approved equal.
3. Apply topping in strict accordance with the recommendations of the manufacturer.

2.7 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F.

C. Use high-range water-reducing admixture in all pumped concrete. Pumping concrete without a high-range water-reducing admixture is not permissible without prior consent of Designer.

D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by The Designer.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Use sheet stock only. 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.

3.4 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to The Designer.

B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

C. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. Contraction (Control) Joints in coal shed infill slabs: Construct contraction joints in infill slabs where shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

3.5 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.6 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.

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 machine. 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 set. 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 to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. 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.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to the Designer.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and

defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F (F) 18 (floor flatness) and F (L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling in: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, 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 shown or required to complete Work.

B. Curbs: Provide monolithic finish to interior 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.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints where indicated on drawings, according to manufacturer's instructions, adhesive bonding or mechanically fastening in place. Provide in longest lengths practicable. Lap or splice per manufacturer's directions.

B. Flexible and Chemical Resistant Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.12 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods.

D. Provide moisture curing by the following methods:

1. Keep concrete surface continuously wet by covering with water.
2. Use continuous water-fog spray.
3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch lap over adjacent absorptive covers.

E. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Apply curing compound on exposed interior slabs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's

directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Use membrane-curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

I. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions. Surface prep as per manufacturer's written directions.

3.13 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring and as specified.

B. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

C. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.14 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.15 REUSING FORMS

A. 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-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to The Designer.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of The Designer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces; where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to The Designer.
4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of The Designer for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of The Designer.

H. Repair all existing damaged concrete per ICRI, International Concrete Repair Institute guidelines including 310.1R-2008, “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion” and repair product manufacturer’s written instructions.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: An independent testing agent will be employed by the Owner to perform tests and to submit test reports. The contractor shall coordinate testing times and activities with the testing agency.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by The Designer.

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 75 cu. yd., plus one set for each additional 75 cu. yd. or fraction thereof.
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 pour 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; 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. Unit Weight: ASTM C 567, fresh unit weight of structural concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
    a. Cast and field cure one set of six standard cylinder specimens for each composite sample when early form stripping is to be performed.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimens at 7 days and two at 28 days. The fourth specimen will be kept as a spare.
    a. When early form removal is to be performed, test two field-cured specimens at 3 days, two at 7 days and two at 28 days. All field cured specimen testing shall be at the contractor's expense. Field cured tests are in addition to lab cured tests.
    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength Test result falls below specified compressive strength by more than 500 psi.
10. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

C. Test results will be reported in writing to The Designer, ready-mix producer, and Owner within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by The Designer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. All additional tests of in-place concrete will be at the contractor's expense.

END OF SECTION 033000

SECTION 055000 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following metal fabrications:

1. Loose bearing and leveling plates.
2. Miscellaneous framing and supports

a. Applications where framing and supports are not specified.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections. Provide submittals for all expansion type anchors.

C. Samples representative of materials and finished products as may be requested by the Designer.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stresses of materials based on Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members.", for handrails, railings, anchors, and connections.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Plates, Shapes, and Bars: ASTM A 36 or ASTM A 992.

C. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated.

1. Finish: Painted.

D. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27 (ASTM A 27M) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead-and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. All exterior steel is to be hot-dip galvanized.

2.3 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Unless otherwise noted provide regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563, and, where indicated, flat washers.

C. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 4 times the load imposed when installed in concrete.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

2.4 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

2.9 STEEL LADDER

A. Provide straight ladders where indicated. Ladders shall comply with requirements of ANSI A14.3.

B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 24 inches apart.

C. Bar Rungs: 3/4 inch-diameter steel bars, spaced 12 inches o.c.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail fences.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 60 inches o.c. with welded or bolted steel brackets.

1. Size brackets to support design dead and live loads and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose neck the extended rails back to the structure to provide secure ladder access.

F. Provide nonslip surface on top of each rung, either by coating the rung with aluminum-oxide granules set in epoxy-resin adhesive, or by using a type of manufactured rung that is filled with aluminum-oxide grout.

G. Galvanize ladders, including brackets and fasteners, in all locations.

2.10 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 STEEL GRATING

A. Provide and install steel grating as indicated on the drawings. Grating shall conform to requirements of ASTM A 569, welded steel grating and comply with ANSI/NAAMM MBG 531 “Metal Bar Grating Manual.” Grating shall be secured to structural supports by means of saddle clips or welding as recommended by grating manufacturer. Perform all cutting, fitting and placement as may be required for installation. Install grating so that cross bars align, provide any additional structural support members, toe angles and plates.

1. Interior valve vault grating: 1 ½ “ x ¼” bearing bars at 1 3/16” on center.
    a. Finish: Galvanized.
2. Exterior valve vault grating (Ventilation Shafts): 2 1/2” x ¼” bearing bars at 2 3/8” on center with cross bars at 4” on center
    a. Finish: Galvanized.

2.13 STEEL PIPE HANDRAILS

A. Assemble handrails and railing systems in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Form changes in direction of members as follows:

1. By flush radius bends.
2. By bending.
3. By mitering at elbow bends.
4. By any method indicated above, applicable to change of direction involved.

C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

D. Welded Connections: Fabricate handrails and railing systems for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

G. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors, platforms and mezzanine. Fabricate to dimensions and details indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, nonmetallic grout in all locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."

C. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 055000

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SECTION 074213.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.

1.02 REFERENCE STANDARDS

A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

1.03 PRE-INSTALLATION MEETING

A. Preinstallation Meeting: Convene one week before starting work of this section notify architect 1 week prior to meeting.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer documentation on tested structural and thermal capabilities of assembled panel.

B. Design and Performance Data: Indicate panel profile and dimensions and structural properties.

C. Manufacturer's Installation Instructions: Indicate special handling criteria.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.06 WARRANTY

A. Weather tightness warranty: Repair leaks within a two (2) year period after Date of Substantial Completion.

B. Limited warranty: Repair or replace items that fail in materials or workmanship within two (2) years, including bond integrity, deflection and buckling.

C. Finish Warranty: Repair or replace metal panels that evidence deterioration of fluoropolymer finish, including flaking or peeling, and chalking or fading in excess of manufacturer's acceptable levels within twenty (20) year finish warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Kingspan; KS Granitstone Wall Panel: www.kingspan.com.

B. Other Acceptable Manufacturers:

1. ATAS International, Inc; Isoleren IM: www.atas.com/#sle.
2. Metl-Span, a Division of NCI Group, Inc; CF Architectural Horizontal: www.metlspan.com.
3. MBCI; CF Architectural Horizontal: www.mbci.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEM

A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.

1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
2. Accommodate tolerances of building structural framing.

B. Performance Requirements:

1. Thermal Performance: Provide thermal resistance through entire system; R-value (RSI-value) of 28 deg F hr sq ft/Btu (5 K sq m/W), minimum.
2. Structural Performance: Design and size to withstand all dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.
    a. Design Wind Loads: Calculated in accordance with North Carolina Building Code for project location.
    b. Maximum Allowable Deflection of Panel: 1/180 of span.
3. Movement: Accommodate the movement caused by the following without damage to system, components, or deterioration of seals:
    a. Normal movement between system components.
    b. Seasonal temperature cycling.
    c. Deflection of structural support framing,

2.03 PANELS AND TRIM

A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place insulation; exterior and interior sheet interlocking at edges. Interlocking edges factory-filled with sealant.

1. Panel Thickness: 4 inch (100 mm).
2. Exterior Sheet: Galvalume steel, pre-finished 22 gage, 0.0299 inch (0.76 mm) minimum base metal thickness; stucco embossed.
3. Interior Sheet: Galvalume steel, pre-finished, 22 gage, 0.0299 inch (0.76 mm) minimum base metal thickness.
4. Panel Edge Profile: Tongue and groove, for flush seam.
5. Exterior Finish: Polyvinylidene fluoride (PVDF) coating; color as selected from manufacturer's standard range.
6. Interior Finish: Polyester coating; manufacturer's standard color.

B. Trim, closure pieces, caps, flashings and infills: Panel manufacturer's recommended extruded aluminum profiles unless noted otherwise on drawings, i.e. outside corner and sills.

1. Exposed Fasteners: Not permitted unless noted otherwise, i.e. outside corner trim.
2. Profiles: To suit system and project conditions.

2.04 PANEL MATERIALS

A. Precoated Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Commercial Steel (CS) or Forming Steel (FS), with AZ50/AZM150 coating; continuous coil coated with acrylic primer coat, polyvinylidene fluoride (PVDF) top coat, and polyester washcoat for panel back.

1. Color of Exposed Exterior Surfaces: As selected by Architect from manufacturer's standard range.

B. Foamed-in-Place Insulation: Polyisocyanurate type.

C. Panel Sealants: Manufacturer's standard type suitable for use with installation of panel system; non-staining, skinning, non-shrinking, non-sagging, ultra-violet and ozone resistant.

2.05 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Exposed Sealants: Elastomeric; silicone or polyurethane, compatible with adhesion to concrete and metal. Install at joint depth, and provide backer rod or bond break tape, and install at joint depth recommended by sealant manufacturer for project conditions.

C. Compressible foam closures: As recommended by panel manufacturer for perimeter of panel system.

D. Foam sealants: Urethane low-expansion type, to seal voids at perimeter of panel system, as indicated on drawings.

E. Fasteners: Manufacturer's standard corrosion-resistant type to suit application.

F. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panel system on walls in accordance with manufacturer's instructions.

B. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

C. Locate panel joints over supports.

D. Use concealed fasteners unless otherwise approved by Architect.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.02 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch (6 mm).

3.03 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION 074213.19

SECTION 230500 – HEATING AND AIR CONDITIONING

230501 GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Heating and Air Conditioning Contractor shall cooperate with the contractors of other trades and shall install his work as fast as the progress of the balance of the work will permit.

C. The Heating and Air Conditioning Contractor shall install all work and fired and unfired pressure vessels and their safety devices in accordance with the requirements of the latest edition of the North Carolina State Building Code. Codes to be a part of these specifications: North Carolina State Building Code, National Fire Protection Association Codes Section 70, 90A, 91 and other applicable sections.

D. The drawings accompanying these specifications indicate diagrammatically the general location of the ducts, piping, and equipment and do not show all offsets, supports, fittings, bolts, connections, etc., required for a complete system. While the drawings are to be followed as closely as possible, if it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner, and as directed by the Engineer. Any detail which is omitted, and which is necessary for the proper operation of any system included under the contract, shall be supplied and installed by the Heating and Air Conditioning Contractor without extra cost to the Owner. All pipes and ducts shall be run as high as possible to maintain ceiling and head clearance. All equipment shall be installed in such a manner as to allow proper maintenance access.

E. Equipment and Materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. All items subject to moisture damage shall be stored in dry spaces.

F. Conditions shall be checked at the building before placing orders for apparatus and such apparatus shall be of such dimensions as to fit the spaces allotted. The Heating and Air Conditioning Contractor shall not scale mechanical plans, but rather refer to architectural plans for dimensions.

G. By signing the Contractor's Proposal, it is understood and agreed that the Heating and Air Conditioning Contractor has, by careful examination, satisfied himself with the quantity, quality, and location of all excavation materials to be encountered in his contract. No additional payment will be approved for well pointing or any other existing conditions encountered. Refer to Division 31 for site work requirements.

H. All debris resulting from heating and air conditioning work shall be removed from the premises daily or as directed by the Engineer. Trash and rubbish shall not be allowed to accumulate either within or outside the building. Materials and debris, which in the opinion of the Engineer cannot practicably be removed from the site the same day, may be temporarily stacked or stored in a designated location on the site as directed by the Engineer.

I. Guards shall be provided for all moving equipment, motor couplings, pump shafts, belt drives and similar exposed reciprocating or rotating components.

J. All HVAC and refrigeration equipment shall be labeled in accordance with Section 301 of the North Carolina Mechanical Code and as required by the Authority having jurisdiction. Labeling shall be a permanent factory-applied nameplate affixed to the equipment on which shall appear in legible lettering, the manufacturer's name or trademark, the model, serial number, and the seal or mark of the testing agency. Third party listing and labeling agencies shall be accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

230502 SCOPE

A. The Heating and Air Conditioning Contractor shall provide labor and materials required for a complete system ready for operation as shown on the drawings and hereinafter specified. This includes all equipment, ductwork, necessary plumbing, and all other services necessary whether they are specifically mentioned herein or not. The entire installation shall be installed in a first-class, neat, professional manner to the satisfaction of the Engineer and shall conform to all applicable codes and laws.

230503 DEMOLITION

A. General Requirements: The work includes the demolition or removal of all construction indicated, specified, or necessary to accomplish the work under this contract. All items not to be reused shall become the property of the Heating and Air Conditioning Contractor. The drawings define the scope of work, but it is not intended that all items of demolition work be specifically indicated. After carefully reviewing the drawings and specifications to determine intent, and prior to bidding, the Heating and Air Conditioning Contractor shall visit the site and determine the extent of demolition work required to properly complete the work under his contract.

B. Protection of Materials and Work: Before beginning any cutting or demolition work, the Heating and Air Conditioning Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of work required. The Heating and Air Conditioning Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced at no additional cost to the Owner.

C. The Contractor shall notify the Owner immediately in the event that any asbestos is encountered during demolition.

D. Refrigerant in Demolitioned Equipment: Recover all refrigerant in approved refrigerant containers and in compliance with section 608 of the EPA Clean Air Act. Removal must be conducted under supervision of an EPA certified technician.

E. See Section 024119 Selective Demolition for additional information and requirements.

230504 SHOP DRAWINGS AND SUBMITTAL DATA

A. The Heating and Air Conditioning Contractor shall submit within 10 days after award of the contract a list of materials and the manufacturer to be used on this project. He shall submit within thirty days after award of the contract at least five copies of submittal data in written form for the Engineer's use in approving materials and equipment. One copy will be returned. If the Heating and Air Conditioning Contractor desires the return of more than one copy, additional copies shall be provided to the Engineer at the time of the original submission. It is requested that all submittal data be sent to the Engineer at one time. Unless special consideration is given, none of the submittal data will be checked until it has all been received by the Engineer. Where called for, the Heating and Air Conditioning Contractor shall submit five sets of shop drawings showing the detailed arrangement or connections that are shown schematically on the drawings. Data certified for the specified project and indicated manufacturer, type, or size, capacity, etc., shall be submitted for the following equipment items:

1. Computer Room Air Conditioning Units
2. Diffusers, Grilles, and Registers
3. Controls with Complete Diagram (Section 230900)
4. Motorized Dampers
5. Access Doors
6. Valves
7. Insulation
8. Duct Sealant
9. Pipe Penetration Details
10. Testing and Balancing

230505 APPROVED EQUAL EQUIPMENT, ETC.

A. Manufacturers listed are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality, free from defect or other imperfections. It should be understood that where the word "provide" is used, it is intended that the Heating and Air Conditioning Contractor shall purchase and install all materials required. Approval of equipment will not relieve the Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Heating and Air Conditioning Contractor.

230506 COMPUTER ROOM AIR CONDITIONING UNITS

A. The Computer Room units shall be split system with indoor and outdoor sections factory assembled and run tested prior to shipment and designed for upflow air delivery with top ducted discharge and rear cabinet return air. The system shall be draw through air arrangement. Units shall be listed and labeled by a third party agency that is accredited by the NCBCC (North

Carolina Building Code Council) to label electrical and mechanical equipment. **Provided indoor section's cabinet maximum width will fit through an existing 34.5" wide doorway**, units shall be manufactured by APC/Schneider, Data Aire, Stulz or approved equal by Liebert.

B. The frame shall be constructed of 14 gauge welded tubular steel. The unit shall have complete front and side access by means of removable furniture grade steel gasketed doors with heavy-duty hinges. The doors shall be lined with one-inch thick, 1-1/2 – pound density fiberglass insulation. Each door shall be provided with sure close latches. The unit shall be painted with factory color chosen by the Owner.

C. The refrigeration system shall be split system type to provide multi-stage cooling with an indoor evaporator section and remote outdoor condenser unit. The indoor evaporator section shall include the compressor(s), cooling coil, humidifier, reheat, filters, condensate pump, and controls.

1. Compressor(s) shall be single circuit single scroll compressor with variable capacity via variable speed drive, hot gas bypass, or multiple circuit multiple digital scroll compressors. Compressors shall be mounted on vibration isolating grommets.
2. Refrigerant shall be R-410A or R-407c.
3. Refrigeration circuits shall be complete with electronic expansion valve, liquid solenoid valve, high and low-pressure safety switches, liquid line filter drier, and refrigerant sight glass with moisture indicator. High and low-pressure safety switches shall be installed with Schrader type fittings with valve core that allows replacement without affecting refrigerant charge.
4. Compressors shall have overload protection on all three power lines internal thermostat for winding protection.
5. Evaporator coil shall be in an "A" frame arrangement, 1/2" O.D. copper tube with 12 fins per inch of corrugated aluminum and controlled by an adjustable thermostatic type expansion valve with external equalization. Cooling coil shall sit in stainless steel drain pan with positive slope for drainage.
6. Field installed refrigerant piping systems between indoor and outdoor sections shall be sized, pitched, and furnished with all specialties as recommended by the unit manufacturer to accommodate refrigerant piping lengths. Specialties shall include traps check valves, suction line accumulators, liquid line solenoid valves, thermal expansion valves, and any other item deemed necessary or recommended by the unit manufacturer.

D. Outdoor condenser section shall be constructed of stainless steel or aluminum. The condenser shall include a low profile, slow speed, direct drive propeller fan air cooled condenser section with powder coated fan guards. The air discharge shall be vertical. The condenser coil shall be constructed with copper tube and aluminum fin with factory applied optional corrosion resistant coating on entire exterior of the condenser coil. The condensing unit shall have fan speed control with transducers to modulate the speed of the first condenser fan motor and provide positive start-up and operation at ambient temperatures to -20 degrees F. Additional condenser fan motors shall be controlled by ambient thermostats. All condenser section controls including the fan speed control shall be factory mounted in an integral factory wired and tested control panel. The condenser unit shall be manufactured by the manufacturer of the indoor unit.

E. Evaporator section blower shall be direct driven plenum fan type with ECM motor statically and dynamically balanced at the factory as a complete assembly. The blower wheel shall be supported on a heavy steel shaft having self-aligning ball bearings with a minimum life span of 60,000 hours. Where indicated on drawings, unit shall have internally insulated factory supply air discharge plenum with adjustable blade diffuser on single side as indicated on the drawings.

F. The filters shall be two-inch (2") or four-inch (4") deep pleated design, rated not less than MERV 11 per ANSI/ASHRAE 52.2. Contractor shall supply complete sets of filters to protect his equipment during construction, changes of filters at testing and balancing, another change of filters at completion, and leave one additional complete set of filters at the project for the next change.

G. The electric reheat coil shall be of the finned enclosed, sheath type, fabricated of stainless steel core sheath with plated fins and SCR control. The reheat coil shall be installed on the air discharge side of the cooling coil and shall have multiple stages.

H. The steam generating humidifier shall be of a self-contained disposable cylinder type with electronic controls. The capacity shall be 10 pounds per hour minimum. The humidifier shall discharge pure steam with no material dust carry-over and have a self-regulating automatic flush cycle. Cylinders shall be disposable, not requiring cleaning or maintenance. The humidifier fill level, water conductivity, and flush rate shall automatically adapt, both in frequency and duration, to variations in the incoming water. Humidifier fill and flush control shall be integral to the unit.

I. The control system shall be unit mounted and furnished with a microprocessor based panel. The panel shall include unit switching functions and display normal functions, malfunctions, and served diagnostics on a 2 row, 80 character, backlit liquid crystal display (LCD) in a clear vernacular format. The panel shall allow recall and display of the high and low temperature for the last 24 hours, high and low humidity for the last 24 hours, current percent of capacity and average percent of capacity for the last hour of operation for cool, reheat, humidification, and dehumidification, component runtimes for fan motor, reheat, humidification, and dehumidification. The control shall include temperature control, humidity control, automatic flush cycles, separate panel for remote monitoring of system alarms, temperatures, operating conditions, etc., BACnet controller/card for unit connection to the existing Brady Trane BAS, and connection to the building's LAN. All information including setpoints, diagnostics, and alarms available on unit's control display shall be available to the existing BAS and LAN. Provide appropriate cables for field installed connections to the building's LAN and to the existing Brady Trane BAS and remote panel and between indoor and outdoor sections. Controls shall also include remote damper control circuit to open/close dampers based on which unit is in operation. Coordinate control voltage, 24V or 110V, with damper actuator. Each unit shall be furnished with capability to function as the zone master and control the operating mode of the other unit(s) located in the same zone. Capabilities shall include:

1. Unit lead/lag and standby rotation with an 8 hour to seven days schedule.
2. Unit auto changeover by selectable standby or off (critical) alarms.
3. Standby unit activation by average zone temperature.
4. Zone functions inhibit preventing units from conflicting operation.
5. Secondary operating schedule for an economical control solution.
6. Programmable unit's status control (On/Off/Standby).

7. Master unit fail safe mode allows slave units to revert their self-control mode.

J. Units shall be furnished with unit mounted factory installed disconnect switch.

K. Units shall interface with the Computer Room's clean agent fire suppression system for shutdown.

L. Units shall be furnished with factory floor stand and vibration isolation pads, floor stand height as field verified.

M. Startup and testing shall be by factory authorized service representative.

N. Units shall have five-year warranty from manufacturer on entire unit including parts, labor, refrigerant, and freight. Manufacturer's warranty start date shall be date of final completion.

O. Manufacturer shall include five-year OEM service agreement on the assets provided within this contract. Agreement shall include the following as a minimum:

1. Semi-annual preventive maintenance performed during agency's normal business hours.
2. Maintenance services provided shall be in strict accordance with manufacturer's service procedures and recommended schedule.
3. Service Agreement shall include filters and their necessary changes.
4. All work shall be completed by manufacturer certified staff or contractors.
5. Full assessment reports shall be provided to the on-site project manager to include any actionable items with due dates.
6. Contract shall be all inclusive of parts and labor.
7. Service Level Agreement shall include a 4-hour maximum response time on any reported emergency.
8. Service provider shall provide a clear process for obtaining support and service during and after hours and work with Port project manager on scheduling/escorting service visits.
9. Physical Address of the equipment will be located at: 2202 Burnett Blvd., Wilmington, NC 28401.

230507 DIFFUSERS, GRILLES, AND REGISTERS

A. Diffusers, Grilles, and Registers shall be as manufactured by Carnes, Metal Aire, Titus, Krueger, Price, or approved equal unless otherwise noted. Diffusers, grilles, and registers shall be factory finish of white color unless otherwise noted.

B. Lay-In Supply Air Diffusers: Shall be steel construction, fixed square louvered face, 4-way blow, panel type to drop in 24" x 24" "T" bar ceiling grid, with adjustable vertical pattern. Vertical air adjustment shall be made by adjusting four perimeter blades to force air down in the vertical position.

C. Lay-in Ceiling Return Air Registers: Shall be aluminum 1/2" x 1/2" x 1" egg crate and frame designed to lay in an inverted "T" bar ceiling grid and with opposed blade dampers. Registers shall be full flow across the entire face of register and tapered up to neck size.

230508 CONTROLS

A. See Section 230900.

230509 MOTORIZED DAMPERS

A. Motorized dampers shall be low leakage type provided in the duct systems as indicated on the drawings in accordance with NFPA Standard No. 90A and shall conform to NFPA Standard No. 90A for materials and workmanship. Blades shall have extruded vinyl double edge seals. Jambs shall have flexible metal compression type seals. Maximum damper leakage at 1.0 in w.g. shall be 10 cfm/sf of damper area for dampers smaller than 24 inches in either dimension and shall be 4 cfm/sf for larger dampers. Leakage ratings shall be when tested in accordance with AMCA Standard 500D. Motorized dampers shall have electric operators and shall be normally closed, unless indicated otherwise in the control diagrams on the drawings. Wiring to operators shall be by the Heating and Air Conditioning Contractor. To facilitate service access and insulation installation, manual damper handles shall be on 2" stand-off brackets. Handles shall be spray painted red. Dampers shall be installed according to the manufacturer's recommendations. Dampers shall be Ruskin, Pottorff, Prefco, Air Balance, United Enertech, or approved equal.

B. Manufacturer's installation instructions for all dampers shall be furnished at time of final inspection. Installation instructions shall be affixed to damper access doors.

230510 ACCESS DOORS

A. Access doors shall be provided for access to all motorized dampers.

B. Duct mounted access doors shall be constructed of No. 22 US gauge zinc-coated sheet steel and shall be gasketed, air tight and provided with not less than two (2) cam-type latches. Doors shall be square and shall be 12" x 12" or two inches less than the height of the duct. Doors shall be two-piece with 1" rigid insulation between the metal sides. Doors shall have engraved plastic laminated labels with 1/2" tall letters indicating item accessed through door.

C. Provide 3/4" diameter red dot on ceiling grid below all duct access doors.

230511 VALVES

A. Valves shall be furnished as specified and as shown on the plans. All valves shall have manufacturer's metal identification disc under the handle nut. Provide valve extension handles for all valves in insulated piping systems. Seats for iron body valves shall be renewable. Valves shall be by a single manufacturer unless noted otherwise. Provide a 3/4" diameter dot on lay-in ceiling grid below all new valve locations. Dot color shall be same as that color specified hereinafter for that piping's finish painting. Provide 19 gauge polished brass valve tag on all valves. Heating and Air Conditioning Contractor shall furnish for new valves a schedule mounted under glass in a frame in the main mechanical room.

B. Ball valves shall have bronze body, synthetic rubber seat rated at 250°F, ball and seat and indicating dial with memory stop. Valves on chilled water systems shall have stem extensions for insulation coverage.

SIZES UP TO AND INCLUDING 2" BRONZE BODY SCREW IN

	BALL
Hammond	8201
Nibco	T-580
Milwaukee	BA-200

230512 ELECTRICAL

A. Electrical circuit sizes are based on capacities of the drawings and it shall be the responsibility of Heating and Air Conditioning Contractor to change any and all electrical work in order to fit mechanical equipment. Heating and Air Conditioning Contractor shall coordinate with Electrical Contractor to assure that all units are properly connected and shall check wiring prior to starting units. Any damage to units resulting from improper wiring or connections shall be the responsibility of Heating and Air Conditioning Contractor. Flexible electrical conduits shall be 18 inches in length maximum. All electrical work shall be installed in accordance with codes having jurisdiction and the Electrical Division, Division 26, of these specifications.

B. Starters shall have integral 120V Control power transformer. Starters shall have holding coil for 120V control with hand-off-auto switch. The starters shall be inoperative if the thermal unit is removed. All magnetic starters shall be NEMA sized with applicable melting alloy overload relays and applicable enclosure. Starters shall be GE or approved equals by Allen-Bradley, Square D, Siemens or Cutler-Hammer.

C. All three phase motors shall be provided with phase loss protection.

D. Fused disconnect switches shall be heavy duty industrial type, NEMA 4X where on exterior. Switches shall be Siemens, General Electric Company, Square D or Cutler-Hammer fusible type mounted so handle is approximately 4 feet 0 inches above floor or grade. Switches shall have a factory applied standard finish. Labeling shall be as indicated in the Electrical Division, Division 26, of these specifications. Each switch for motor circuits shall have a complete set of time delay fuses.

E. Motor Starters and Fused Disconnect Switches shall be neatly arranged, and securely fastened to walls with expansion bolts, lead shields, etc. Each starter or switch shall have labeling as indicated in the Electrical Division, Division 26, of these specifications. Where connections are made to motors not near walls or columns, a vertical conduit attached to floor and ceiling shall be installed and the wiring carried in and out of this conduit by means of condulets. An 18-inch length of flexible metallic conduit shall be installed in the circuit to each connection to a motor. Liquid tight shall be used in all wet locations. Grounding wire shall run inside of flexible conduit.

230513 DUCTWORK

A. Mechanical drawings are schematic only and do not show all offsets etc. required. Heating and Air Conditioning Contractor shall familiarize himself with the complete contract documents and

site conditions before fabricating ductwork. Any changes to ductwork found necessary to accommodate the conditions at the building shall be made without additional cost to the Owner, and as directed by the Engineer.

B. During construction, interior of ductwork shall be protected. All open ends of ductwork shall be covered with self-adhesive 3 mil polyethylene film.

C. Ductwork shall be of galvanized steel with standard gauges and construction in accordance with the recommendations of SMACNA HVAC Duct Construction Standards, Metal and Flexible, Third Addition, 2005 for appropriate pressure class. Airfoil turning vanes with 1-1/8" spacing and rail support system shall be installed in all 90º elbows. Ductwork shall be cross broken on all sides and shall be supported at both ends of each joint and at 10'-0" intervals maximum with galvanized angles supported by galvanized threaded rods of sizes and spacing in accordance with SMACNA. Ductwork to be exposed shall be constructed in a first class, neat, professional manner and exposed ductwork with excessive hammer marks shall be replaced. Round supply takeoffs from trunk ducts shall be made with factory 45º entry branch rectangular to round type fittings with dampers. Damper handles shall be on 2" stand-off brackets. Handles shall be spray painted red. Splitter dampers shall be provided where indicated with adjustment quadrant locking device and shall be constructed of two thicknesses of 24-gauge-galvanized steel. All dimensions on the drawings are free inside dimensions. All components of the air distribution system shall be mechanically fastened with at least three equally spaced sheet metal screws with screws not more than on 12" centers. All duct joints shall be sealed in accordance with SMACNA Seal Class A before insulation is applied. All sealants shall meet the provisions of UL181.

D. Final 8'–0" of the runout to the air outlet may be factory fabricated flexible ducts complying with NFPA Standard No. 90A, UL 181, and shall be UL Class 1 R-6 insulated type with foil vapor barrier. The flexible duct shall be air tight for factory test when bent to full recommended radius and under not less than 10" water gauge internal pressure and shall be limited to 8'-0" maximum length. Flexible ducts shall be supported by galvanized steel straps in accordance with SMACNA at intervals not exceeding 4'-0" and at each change of direction. Flexible ducts shall have a minimum of one support.

230514 PIPING

A. The Heating and Air Conditioning Contractor shall furnish all piping and supports necessary to provide a complete system as shown or intended by the plans and specifications. All piping shall be inspected, tested, and approved before being insulated or concealed. Piping 2" and smaller shall be welded or have screwed fittings with extra heavy nipples, unless otherwise noted. Piping 2-1/2" and larger shall have welded fittings of the same material and weight as the piping in which they are installed. Pipe shall be clean, run generally parallel to the building and have all open ends closed with iron caps at all times. Eccentric reducers shall be used in horizontal runs and concentric reducers in vertical runs. All piping and fittings shall have manufacturer’s identification and ASTM designation incorporated thereon. All piping and fittings shall be made in the United States.

B. Drain piping, condensate piping, and makeup water piping shall be Type L copper with all joints soldered with 95-5 solder. Piping shall have dielectric connection to ferrous pipe. Drain and

condensate piping shall have a minimum slope of 1/4" per linear foot, and shall be at least as large as unit condensate connection.

C. Refrigerant piping shall be capped and dehydrated Type “L” hard drawn copper with wrought fittings. All joints shall be brazed with silver brazing alloys according to manufacturer’s published recommendations.

D. Welding material and labor shall be in accordance with welding procedures of the American Standards Code for Pressure Piping ASA B31.9. Welders shall be fully qualified in above specified procedure, tested, and so certified by an approved Welding Bureau of Locally Recognized Testing Authority. Welding shall be electric arc or oxyacetylene welding method as approved using electrodes and rods that comply with ASTM specifications.

E. Swing joints or loops shall be provided wherever necessary to allow for expansion of piping. Broken piping or fittings shall be removed and replaced at the Heating and Air Conditioning Contractor’s expense.

230515 PIPE HANGERS

A. All piping shall be neatly and securely supported by hangers spaced in the following manner:

1. Copper Piping 1-1/4" and smaller - 6'-0" O.C.
2. Copper Piping 1-1/2" and larger - 10'-0" O.C.
3. Provide 2 hangers at each change in direction.

B. Hangers shall be the Clevis type as manufactured by Modern Fig. 590, B-Line Fig. B 3100, or Grinnell Fig. 260 complete with hanger rods of size to conform to the type of hanger and pipe supported. Hangers shall be attached to the building by beam clamps or bolted to bar joist. At hangers provide 16" long 16 gauge galvanized sheet metal protection saddle three times the nominal pipe diameter. Under no condition shall hangers be connected directly to insulated pipe. Saddles shall be Modern Type A, B-Line Fig. B 3151, or Grinnell Fig. 167.

C. Hangers for vertical piping shall be riser clamp design as manufactured by Modern Fig. 500, B-Line Fig. B3373 or Grinnell Fig. 261. Riser clamps shall be installed on top of each floor penetration.

D. Condensate and refrigerant piping on roof shall be supported by EPDM rubber bases with integral pipe securement. Support shall be OMG PGM, PGS, PGTS -BK or approved equal. Walk pads under each support shall be appropriate for roof per roof’s warranty requirements.

230516 INSULATION

A. All piping and ductwork shall be inspected and tested before insulation is applied. All insulation shall meet UL 723 and ASTM-E84 flame spread and smoke developed requirements of 25/50 and shall comply with NFPA 90A and the latest edition of the NC Building Code. Insulation shall be Certainteed, Owen Corning, Knauf, or Johns-Manville.

B. Air conditioning supply, return, and outside air ducts above a ceiling and back of diffusers and grilles shall be externally insulated with 2" thick 1 lb. density foil scrim kraft jacketed insulation.

Adhere insulation to duct with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum centers. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. Tape all joints, breaks, punctures, and any penetrations with SMACNA foil faced kraft duct tape.

C. Where externally insulated ductwork is supported by angles, provide 6” long x duct width x 1-1/2” thick 6.0 pound density board insulation on bottom of duct at hanger support. External duct insulation shall be continuous around ductwork and board insulation at duct hanger. On round ducts, duct hanger shall be outside duct insulation.

D. Ductwork exposed in Computer Room shall be externally insulated with 2” thick R-8.0 minimum duct board with FSK facing. All joints shall be taped per manufacturer’s recommendations. Insulation shall be completely secured to ductwork with pins and washers on all surfaces and sides.

D. Drain piping, condensate piping, makeup water piping, and all refrigerant piping shall be insulated with wall tubular closed cell elastomeric insulation with all joints butted and cemented tight. Insulation thickness shall be 1” for condensate and water piping and 1-1/2” for refrigerant piping.

E. All exterior piping insulation above grade shall be provided with a protective aluminum jacket with a factory-applied poly backing moisture barrier. Aluminum jackets shall be cross-crimped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.016" thick and shall be secured with aluminum or stainless steel screw; not more than 8" apart. Each jacket shall be applied by turning a 1" hem inward on one longitudinal edge and then lapping the hemmed edge over the unhemmed edge. The jacket may be machine cut to produce a straight smooth edge and the hem omitted. The longitudinal and circumferential seams shall be lapped not less than 2". Jackets on horizontal lines shall be so installed that the longitudinal seams are on the bottom half of the pipe with the seam of each jacket slightly offset from the seam of the adjacent jackets; top edge shall overlap bottom edge. The jackets on vertical lines and lines pitched from the horizontal shall be installed from low point to high point so that the lower circumferential edge of each jacket overlaps the jacket below it. Special fitting jackets conforming to the above with the exception of longitudinal lapping dimensions and location of seams shall be used for fittings, valves, and flanges. Jackets for fittings, valves, and flanges shall be properly overlapped and secured. Equivalent aluminum jacketing system, when approved, will be acceptable.

230517 SPECIALTIES

A. Floor, wall and ceiling plates or escutcheons of size to fit pipe covering shall be installed where pipes pass thru finished areas and shall be chromium plated spring type as manufactured by Kenney, Connecticut Stamping and Bending Company, Dearborne or approved equal.

B. Unions or flanges shall be provided throughout the piping system to facilitate the removal and servicing of all valves, equipment, items, etc.

C. Strainers shall be screwed (2" and smaller) or flanged (2-1/2" and larger), Y type, 125 pounds, with removable stainless steel screen and shall be provided with close-nipple blowout, ball valve, and

hose end connection on discharge side. Screen perforations shall be suitable for water flow as appropriate.

230518 FOUNDATIONS

A. All concrete and reinforcing steel for foundation slabs under equipment shall be provided by the Heating and Air Conditioning Contractor. Foundations shall extend beyond all equipment by 4" in all directions and shall be made from 3,500 PSI concrete reinforced with 10/10 x 6/6 wire mesh. Foundation surfaces shall be troweled smooth and edges shall be tooled. Equipment pads on interior shall be painted OSHA approved yellow.

B. See Section 033000 Cast-In-Place Concrete for additional information and requirements.

230519 VIBRATION ISOLATION

A. Pad type isolators shall be 3/4” thick bridge bearing quality neoprene ribbed or waffled on both sides. Pads shall be selected for a maximum durometer of 50 and designed for 15% deflection. Where required, steel load-spreading plates shall be incorporated between the equipment and the neoprene pad.

B. Flexible duct connections, both at inlet and discharge of air handling units, shall be made of 30 oz. workinglass fiber coated with neoprene, sewn together at edges and joints. These flexible connections shall withstand the operating air-pressure, shall not permit air leakage, and shall not transmit vibration.

230520 OPENINGS

A. The Heating and Air Conditioning Contractor shall furnish all blockouts, sleeves, and openings required for his work. Pipe sleeves, where firestop penetration system allows, shall be standard weight black steel pipe and shall be provided where pipes pass through walls and floor. Sleeves through walls shall butt flush with the wall finish and shall be of sufficient size to permit passage of pipe covering through the area where pipe is installed. Sleeves through floors shall extend 3/4" above the finished floor and sealed watertight. Any penetrations of ducts through floor shall be curbed 3" high x 6" wide with concrete. Specifically inform the General Contractor as to the correct size and location of openings and sleeves to insure that they shall be cast in their proper location. Sleeves and duct opening frames shall be furnished and installed by the Heating and Air Conditioning Contractor. Failure to indicate such openings in time to avoid delaying the General Contractor shall result in the Heating and Air Conditioning Contractor providing all cutting and repairing at his own expense. Repairing shall include sealing tight around pipe sleeves and duct frames in a neat and professional manner and in accordance with the “Cutting and Patching” section of this specification.

B. All penetrations in rated floors, firewalls and any other rated separations shall be protected using a through-penetration firestopping method with an “F” rating equivalent to the rating of the membrane being penetrated for particular piping materials used and membrane construction type. Floor penetrations shall additionally have a “T” rating equivalent to the rating of the floor

being penetrated. Through-penetration firestop systems shall be installed and tested in accordance with ASTM E814 or UL 1479.

230521 PIPE MARKERS

A. Markers shall have wording, wording colors, and wording background in accordance with ANSI A13.1. Markers shall have letters approximately 1" high on appropriate background, flow arrows, and shall be located on the duct or pipe at intervals not exceeding 10'-0". Markers shall be plastic with markers on piping completely encircling the pipe with overlap and permanent tension in the marker to grip the pipe firmly with the need of adhesives.

B. Provide markers on all new piping in the building. Wording of markers shall be as follows:

1. Refrigerant
2. Drain
3. Condensate
4. Makeup Water

230522 NAMEPLATES

A. All new CRAC units shall be furnished with engraved plastic laminated labels permanently attached to the equipment. Lettering shall be ½" tall. Label shall include equipment number, area served, final acceptance date, number and size of filters, and capacities. Final acceptance date shall be on a separate label so as to allow equipment nameplates to be installed prior to final acceptance. The following are examples of labeling to be used:

Packaged Heat Pumps: PGAC#1 (Main Entry and Staff)

Filters: 2 @ 24 in. x 24 in. x 4in.

Belts: 1 @ A45

Capacity: 2,000 CFM @ 1.0" ESP
5 Tons

Final Acceptance: 11/16/2018 (5 Year Comp. Warranty)

230523 CUTTING AND PATCHING

A. The Heating and Air Conditioning Contractor shall do all cutting and patching necessary to install all equipment as required under his contract in accordance with the General Conditions of these specifications and shall re-establish all finishes where cutting and patching occur to their original condition. All cutting of the structure, where unavoidable, must be approved by the Engineer and be done by the General Contractor, but shall be paid for by the Heating and Air Conditioning Contractor.

230524 PIPING PRESSURE TESTING

A. The Heating and Air Conditioning Contractor shall make the following tests of the new systems before they are insulated or covered by construction. The systems shall have no decrease in

pressure during the test periods. All system components shall be protected from test pressures that exceed manufacturer's design limits.

B. Notify Engineer and Owner 48 hours in advance of all tests.

C. New refrigerant piping shall be tested in accordance with Chapter 11 of the North Carolina Mechanical Code and unit manufacturer's recommendations.

D. New drain piping, condensate piping, and makeup water piping shall be tested by applying a hydrostatic pressure of 100-psig for a period of two hours.

E. No caulking of joints shall be permitted. Any joint found to leak under this test shall be broken, remade, and a new test applied. Welded joint pinhole leaks shall be repaired by welding; however, welds that show numerous pinholes shall be replaced.

230525 TESTING AND BALANCING

Testing and balancing of the renovated or new heating, ventilating, and air conditioning systems shall be performed by an independent AABC certified Test and Balance Company as a subcontractor to the Heating and Air Conditioning Contractor. All instruments used shall be accurately calibrated and in good working order. The tests shall be in strict accordance to the Standards of AABC.

Air balance and testing shall not begin until the systems have been installed in full working order and shown to be operating satisfactory on both heating and cooling. The Contractor shall place all heating, ventilating, and air conditioning systems into full operation and shall continue operation of the system until balancing is completed. All operational cost shall be borne by the Heating and Air Conditioning Contractor. The Engineer and Architect shall be given advance notice of time when tests are to be made.

Upon completion of the heating, ventilating, and air conditioning systems, the Heating and Air Conditioning Contractor shall compile the test data and submit three copies of the completed test data separate for each building to the Engineer for evaluation and approval. At final inspection and prior to final commissioning verification, Heating and Air Conditioning Contractor shall have a copy of test and balance report and all necessary personnel and equipment to facilitate spot-checking of test and balance data by the Engineer or his representative. Final payment to the Contractor shall be withheld until the complete test and balance data has been approved.

A. Testing Procedure (Air):

1. Test and adjust unit fan's RPM and CFM to design requirements. Record all data.
2. Test and record motor full load amperes on all motors.
3. Adjust all main supply, exhaust, return, relief and outside air ducts to proper design CFM when air handling systems are in normal operating mode. Record exhaust and outside air data.
4. Test and adjust each diffuser, grille, and register for supply, exhaust, or return systems to within 10% of design requirements. Record all data.
5. All adjustments to air diffusing devices where possible shall be made in trunk or run out dampers, not at diffuser volume control.

6. Power ventilator fans shall be tested and balanced for the requirement as shown on the plans. Record all data.
7. The Heating and Air Conditioning Contractor shall make any changes in the pulleys, belts, filters, dampers, or valves necessary or as recommended by the Engineer for correct balance at no additional cost to the Owner.

230526 INSTRUCTIONS/TRAINING

A. The Heating and Air Conditioning Contractor shall provide a minimum of one 8-hour day instruction and training period in the operation of the new apparatus to the persons who will be in charge of the system.

230527 MAINTENANCE DATA

A. For all new or renovated items requiring maintenance, the Heating and Air Conditioning Contractor shall furnish two weeks prior to Final Acceptance and deliver to the Owner's representative on the job multiple copies of complete data as prepared by the manufacturer covering the details of operation and maintenance and complete parts list for all equipment specified. Each copy of the maintenance data shall be assembled into a 3-ring hardback binder with indexing and label on cover and spine. Data shall include:

1. Index with page numbers.
2. List of all subcontractors and suppliers with names, addresses, and phone numbers.
3. Contractor's certificate of Final Acceptance.
4. Copy of all warranties.
5. Equipment model numbers, etc. indicated and referenced with the same mark as shown on equipment on the drawings.
6. Filter schedules of sizes and quantities for all equipment requiring filters referenced by mark on the drawings.
7. Equipment summary showing all capacities and ratings.
8. Certified test and balance report.
9. Start-up and test reports for equipment.
10. Complete start-up, operation, and shut-down procedures for each system.
11. Lubrication schedules and types of lubricates.
12. All submittal data and shop drawings, unless included in a separate manual.

230528 RECORD DRAWINGS

A. Heating and Air Conditioning Contractor shall maintain "during the course of the work" a set of specifications and drawings marked up to show the new or renovated work as installed, **including dimensions to indicate locations and elevations of buried work**. Upon completion of the work, return this set of drawings to the Engineer.

230529 GUARANTEE

A. The Heating and Air Conditioning Contractor shall guarantee the new and renovated portions of the heating and air conditioning systems subject to the General Conditions of these specifications, except:

1. See CRAC units article for warranty requirements for that equipment.

END OF SECTION 230500

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

1.01 GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Existing BAS system is BuildingLogix by Brady Trane through Tridium Niagara AX head end Jace panel communicating with Trane BuildingLogix and Johnson Controls FCU controllers for the existing four-pipe fan coil unit system.

C. New connection(s) to BAS system shall be BACnet as an extension of the existing Trane BuildingLogix with 100% compatibility and functionality to view, command, trend and schedule the newly installed and existing equipment from the existing central workstation and portable operator's terminal. Provide all necessary gateways, controls, etc.

D. Bids by wholesalers, distributors, mechanical contractors and non-franchised contractors shall not be acceptable.

E. The Contractor shall, as a minimum, manufacture (in their factory plant) and supply the Building Controller, Unitary Digital Controller, and Graphical User Interface software as required for this project. Private labeling of another manufacturer's product will not be allowed for this project.

F. All bidders must be a factory branch or authorized representative of a national firm having a minimum of ten (10) years' experience in the design and installation of computerized building systems similar in product and performance to that specified and proposed. Provide evidence of experience by submitting resumes of the project manager, the local manager, project engineer, the application engineering staff, and the electronic technicians to be involved with the supervision, the engineering, and the installation of the system specified herein. Information concerning the amount of experience shall be included in each resume.

G. All bidders must use only factory trained and certified personnel to perform programming, final DCP connections, system start-up, diagnostics and warranty service. Must maintain a 24-hour per day service organization within 2.5 hour auto travel time from the project.

H. The equipment and software proposed by the supplier shall be currently in manufacture. No custom products shall be allowed unless required by the specification. All products shall be supported by the manufacturer for a minimum of 5 years, including spare parts, board repairs and software revisions.

I. If the proposed building control system requires a "gateway" panel to provide the functionality described above, then the "gateway" panel must be furnished and installed by factory authorized/certified personnel of the Controls equipment. Contractor must disclose to the Engineer/Owner at time of bidding if a "gateway" panel is required. Certificates of factory certification/authorization must be presented to the Engineer and Owner.

J. Contractor must show evidence to the design team that the proposed system and products will be manufactured and supported by the installing contractor for a minimum of 5 years.

K. All bidders must have installed and completed at least ten (10) direct digital temperature control jobs of similar design using the same equipment as specified. Contractor must provide references to the design team and Owner 14 days prior to bid.

L. Control contractor must carry an Unlimited Electrical License in the state of North Carolina.

M. All bidders must have a service office within 150 miles of the site.

1.02 SCOPE OF WORK

A. The work under this section of the specifications and drawings includes the installation of a complete building automation system utilizing distributed digital controllers as an extension of the existing system.

B. The Contractor shall furnish and install a complete connection to building automation system, including all hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. All software required shall be turned over to the Owner ready for use including all operation parameters, setpoints, and schedules.

C. The Contractor shall obtain and pay for all necessary licenses.

D. The Contractor shall execute his work in such a manner as to cause the minimum interference to the operation of the building.

E. The Contractor shall furnish all new control valves and automatic dampers. Installation will be by the Heating and Air Conditioning Contractor.

F. The Contractor shall provide all necessary field wiring.

G. A color graphic shall be provided for each new system and control. All new control points shall appear on graphics.

1.03 OPERATING ENVIRONMENT

A. All controllers shall operate in an environment of 32°F -120°F and 10-95% relative humidity.

B. All controllers shall be UL approved as an Energy Management System (UL 916). Controllers shall also be FCC approved.

1.04 SUBMITTALS

A. All shop drawings shall be prepared on AutoCAD/Visio software or equivalent. In addition to the drawings, the Contractor shall furnish a CD containing the identical information.

B. Shop drawings shall include a riser diagram depicting locations of all controllers, associated network wiring, and pneumatic control air piping. Also included shall be individual schematics

of each mechanical system showing all connected points with reference to their associated controller. Typical will be allowed where appropriate.

C. Control, sequence of operation, and testing for smoke control system shall be submitted as a complete package.

D. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. In addition, submittals shall contain sequences of operation, program listings, point lists, and a complete description of the graphics including print out of the graphic for each system type, reports, alarms and configuration to be furnished with the work station software. Information shall be bound or in a three ring binder with an index and tabs.

E. Submit five (5) copies of submittal data and shop drawings for review prior to ordering or fabrication of the equipment. All documents shall be checked for accuracy by the Contractor prior to submitting.

F. The Engineer will note corrections needed, and if required, return to the Contractor. The Contractor shall then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.05 WARRANTY

A. The Contractor shall provide a warranty against defects in materials or workmanship in the BAS as described in the General and Supplementary Conditions.

1.06 TRAINING

A. The Control Contractor shall provide factory-trained instructor to give full instruction to designated personnel in the operation of the system installed. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The Contractor shall provide all students with a student binder containing product specific training modules for the system installed. All training shall be held during normal working hours of 8:00 am to 4:00 PM weekdays.

B. Provide four (4) hours of training for Owner's designated operating personnel. Training shall include:

1. Explanation of drawings, operations and maintenance manuals
2. Walk-through of the job to locate control components
3. Operator workstation and peripherals
4. DDC controller and ASC operation/function
5. Operator control functions including graphic generation and field panel programming
6. Operation of portable operator's terminal
7. Explanation of adjustment, calibration and replacement procedures
8. Student binder with training modules
9. Use of workstation and graphics software (refresher course)

C. Any vendor who does not already have an existing system installed at the NCSPA Wilmington Facility shall provide a two week factory training class at the manufacturer's training facility for up to four NCSPA employees. The Contractor must include all travel and lodging expenses for the trainees.

1.07 INSTRUCTION AND DIAGRAMS

A. The Heating and Air Conditioning Contractor shall provide to the Owner a complete instruction manual covering the function and operation of all control components. The manual shall also contain a schematic drawing of each control system properly marked and keyed with the equipment list to identify each item of control equipment. See Section 230500 for more specific requirements for Operation and Maintenance Manuals.

B. The Heating and Air Conditioning Contractor shall also provide a complete schematic control diagram with typewritten sequences of operation framed under glass and mounted on the wall in the equipment rooms.

1.08 AS-BUILT DRAWINGS

A. Contractor shall provide at end of the project a complete set of control diagrams and sequences of operation to reflect the as-built installation. These documents shall be turned over the Architect.

1.09 ARCHITECTURE

A. The Building automation system shall consist of a network communications module, supporting peer-to-peer distributed controllers on a field bus. Valves and dampers on all equipment shall be electronically actuated.

B. The field bus shall support local control units of modular size for operation of the building's HVAC, lighting and access control systems. This bus shall operate at a minimum speed of 19200 baud, with a minimum length of 4000 feet or 32 nodes before requiring a network repeater. Manufacturers with baud rates of less than 19200 shall be accepted, but shall be limited to 32 network controllers to insure adequate global data and alarm response times.

C. The field bus shall permit peer to peer communications among all controllers and allow simultaneous communications with laptop computers that are connected to a controller. Failure of the network controller shall not impair the operation of its associated field bus.

D. All points shall be considered global points. Any program in any controller on the network shall be able to reference any point in any controller regardless of its location on the network.

E. Remote access to the network shall be through a standard dial-up modem provided by the Contractor and connection to building's LAN.

1.10 INSTALLATION

A. Installation of the building automation system shall be performed by the BAS Contractor or approved subcontractor. However, all installation shall be under the personal supervision of the Contractor. Under no circumstances shall the design, scheduling, coordination, wiring termination's, programming, point calibration and check-out, training, and warranty requirements for the project be delegated to a subcontractor.

B. All wiring shall be installed in accordance with all applicable electrical codes and shall comply with equipment manufacturer's recommendations. Digital signaling wiring shall be plenum rated NEC Class 2. For other than digital signaling use, copper wire or control cable shall be #18 minimum (#22 minimum where runs do not exceed 100 linear feet).

C. All controllers and field interface panels shall be plenum rated; mounted in enclosures suitable for the intended environment.

D. All outside mounted enclosures shall meet the NEMA-4X rating.

E. Wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

F. Control and interface panel assemblies shall be constructed by a UL approved industrial control panel shop and bear a UL approval label on the exterior of each panel. This requirement shall be strictly enforced.

G. All control conductors shall be color coded and identified with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings. Where conductors pass through a junction box or connect to a device, the conductors shall be tagged to indicate the circuit and/or terminal number to match BAS shop drawings.

H. All field enclosures, other than controllers, shall be identified with a permanent nameplate.

I. Junction box covers shall be painted and marked to indicate that they are a part of the BAS system. Marking shall include circuit and/or terminal number per BAS shop drawings.

J. Wiring splices shall occur only at terminal boxes. Wire nuts or crimp splices shall not be permitted. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.

K. Conduit, in finished areas, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction.

L. Conduit, in non-finished areas, where possible shall be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit shall run parallel to or at right angles to the building structure.

M. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.

N. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

O. BAS wiring above hard ceilings, in walls, or where exposed including in mechanical rooms shall be in 3/4" minimum EMT conduit with steel-plated hexagonal compression connectors. BAS wiring above lay-in ceilings may be installed as properly supported cable. Flexible metallic conduit shall be ½" minimum in size and shall not exceed 3'-0" in length. Per Paragraph 1.10.B, all BAS wiring shall be plenum rated.

P. All wiring in floor slabs or on exterior shall run in rigid conduit.

Q. Provide engraved plastic laminated or plastic tape label on ceiling grid or wall/ceiling access door below any BAS controller/control device requiring service, maintenance, and/or adjustment. Label text shall match the device's identifier/symbol noted in the BAS submittal data/O&M Manual.

R. Electrical Contractor will provide a source of power for all panels, controllers, etc. "Source" shall include conductors, raceways, circuit breakers, junction boxes, panelboards and/or wiring troughs as required by conditions and codes and/or as shown on the contract drawings.

S. In general, individual disconnecting means for each panel, controller, etc. will be furnished and installed by the BAS Contractor. Line side connections will be made by the Electrical Contractor. All load side wiring will be accomplished by the BAS Contractor.

1.11 FIELD DEVICES

A. Included with field devices are all sensors, transmitters, transducers, wells, relays, switches and power supplies necessary for the operation of the BAS.

B. Also included are control valves, valve actuators, damper actuators, and conventional controls necessary for a completely functioning system in accordance with the sequence of operation.

C. All sensors and signal conditioning equipment shall be of the type which are universally accepted in the industry, can easily be second sourced and are compatible with all of the manufacturer's equipment.

D. Space temperature sensor shall have an accuracy of $\pm$1.0°F with minimum operating span of 45°F. to 95°F. Sensors shall be stainless steel plate with a thermistor thermally bonded to back with fully insulated gasket.

E. All digital inputs shall be provided by dry contacts. The contacts shall be wired normally open or normally closed as required.

F. Motor status (pumps, fans, etc.) shall be monitored by adjustable current sensing switch.

G. The use of multiplexers will not be accepted.

H. All digital outputs shall be electrically isolated from the digital controller by interface relays.

I. Field relays shall have a minimum life of 1 million cycles without failure.

J. When fail-safe positioning is required, the actuator shall have spring return.

K. Provide actuator auxiliary switches or slaved potentiometers as required.

1.12 CONTROLLERS

A. A controller shall have its own on-board CPU, RAM, and ROM, laptop communication port, and network connection to the field bus. The Controller contains its own on-board I/O for complete standalone operation. Controllers may optionally provide a local display.

B. The firmware shall consist of the operating software, communication software, programming language, and resident control application software. Controllers may be optionally programmed from the laptop computer. The custom application software shall reside in battery backed RAM or EEPROM. RAM may also be used for storing trend data and clock/calendar information.

C. Controllers shall provide standalone control of HVAC, lighting, or access control. Each controller shall have its own control programs and shall continue to operate in the event of a failure to its associated network controller.

D. Control programs shall be stored in battery backed-up RAM and EPROM. Each Controller shall have the intelligence to perform all control strategies, without communication to other controllers, for control functions not requiring data from other controllers.

E. Each Controller shall be able to have its program edited and/or modified either locally through a laptop computer service tool or through a work station connected to a network controller. Each Controller shall complete its internal scan in less than one second. Each scan shall consist of updating of inputs, importing of data from other controllers, performing mathematical calculations and sequencing appropriate outputs for local loop control.

F. Controllers shall provide communication to the field bus. In addition, a port shall be provided for connection to a laptop computer service tool to support local programming and parameter changes.

G. The input section of Controllers shall provide “universal” inputs capable of accepting information on any point in the form of a temperature, voltage, digital, or pulse counter with only a programming command required for differentiation between the input types. No hardware changes shall be required.

H. All inputs shall withstand continuous shorting to 120VAC, 60 Hz power referenced to ground without failure. All inputs shall further be protected to ±1500 volts for 50 microsecond transients. All inputs shall have an accuracy of at least ±15mV, and a resolution of 4.8 mV from 0°F-120°F.

I. Analog Inputs - the Analog Input (AI) function shall monitor each analog input, perform A/D conversion, and hold the digital value in a buffer for interrogation. The A/D conversion shall

have a minimum resolution of 10 bits. Input ranges shall be within the range of 0-10 VDC or 4 - 20 mA.

J. Digital Inputs - the Digital Input (DI) function shall accept dry contact closures and voltage level transitions. A voltage level below 1 volt shall be read as ON (closed); a voltage level above 3 volts shall be read as OFF (open).

K. Pulse Accumulator Inputs - the pulse accumulator input function shall have the same characteristics as the DI, except that, in addition a buffer shall be included to totalize pulses between interrogations. Each input shall accept pulses at a minimum of 5 per second.

L. Temperature Inputs - temperature inputs originating from a thermistor, shall be monitored and buffered as an AI, and provide automatic conversion to degrees Fahrenheit or Celsius without any additional signal conditioning.

M. Input Wiring - all inputs shall be two wire devices and shall not require shielded wire for accurate operation.

N. Outputs - output types shall include digital, universal and tri-state. With the exception of terminal unit controllers, outputs shall be available with built-in hand-off-auto switches for local overrides.

O. Digital Output - the Digital Output (DO) function shall provide contact closure for momentary (Pulse Width Modulation) and maintained operation of field devices. Output pulse width shall be selectable between 0.1 and 3200 seconds with a minimum resolution of 0.1 seconds. Isolation and protection against voltage surges up to 180 VAC peak shall be provided. Contact rating shall be a minimum of 2 amps at 24 VAC. An LED shall be provided to indicate the state of each digital output.

P. Universal Output - a Universal Output shall provide 0-20VDC, 0-20 mA control signal (with a maximum resolution of .1 volt and .1 mA), and standard Form C relay operation (5 amps, 50 VAC). It shall be possible to select the mode of output operation for each output by simply wiring to the appropriate terminations on the controller. No circuit boards or output cards shall have to be exchanged to select the desired output mode.

Q. The Form C output mode shall be capable of standard digital output operation including pulse width modulation.

R. All current outputs shall be fuse protected to 120VAC.

S. Tri-State Outputs - tri-state outputs shall consist of two 24VAC relays for control of bi-directional motors and actuators. Each tri-state output shall be capable of PWM (pulse width modulation) to a resolution of 0.1 second.

T. The Controller shall have an optional real time clock. The accuracy shall be within 10 seconds per day. The RTC shall provide the following information: time of day, day, month, year, and day of week. Each Controller shall be capable of receiving a signal over the network to synchronize all Level 2 real time clocks to the same time.

U. Upon restoration of power, the Controller shall automatically and without human intervention: update all monitored functions; resume operation based on current, synchronized time and status, implement special start-up strategies as required.

V. Each Controller shall have at least 5 years of battery back-up to maintain all volatile memory. Building controllers shall have UPS backup.

W. Main controller shall have modem for dial-up connection to entire BAS system and Cat 5 cable to connect to building's LAN.

1.13 SOFTWARE

A. The application software shall be configured for each controller either locally through a laptop computer service tool or through a work station. Level 1 controllers shall contain PROM as the resident operating system. Application software shall be RAM resident. Application software shall only be limited by the amount of RAM memory. There shall be no restrictions placed on the type of application programs in the system.

B. Each controller shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function by controllers shall not be interrupted due to normal user communications including; interrogation, program entry, printout of the program for storage, etc.

C. Real-Time Operating System - provide a real time operating system in PROM memory requiring no operator interaction to initiate and commence operations. The program shall include:

1. Operation and management of all devices
2. Error detection and recovery from arithmetic and logical faults
3. Editing software to allow the user to develop or alter application programs
4. System self-testing
5. Multi-user
6. Multi-tasking

D. Editor - when programming a controller through either a dumb terminal or laptop computer, editing and word processing features shall include as a minimum:

1. Cut, copy, paste, and undo
2. Search and replace
3. Comments
4. Scrolling
5. Character, line, and page cursor control

E. When programming in terminal mode, the system shall allow full screen, character editing for correction or modification of any portion of a program. Syntax errors shall be highlighted, and programmers must make corrections prior to the program being compiled.

F. Point Identification - users must be able to assign unique identifiers for each connected point. Identifiers must have at least sixteen alpha/numeric characters. All references to these points in programs, reports, and command messages shall be by these identifiers.

G. Each point name can have up to a 32 character description, and optionally engineering units (up to 8 characters).

H. User Programming Language - the application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be English language and programmable by the user.

I. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords, and histories.

J. The language shall allow the creation of timers anywhere in the logic of a program. Each timer shall increment in seconds and increment to a maximum of 365 days.

K. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.

L. Application Software - the system shall contain include ROM based, built-in software modules for the creation of standard application programs. Modules shall include as a minimum:

1. PID Algorithm
2. Self Tuning PID
3. Calendar Functions (Seconds, minutes, hour, day of week, day of month, day of year, month and year)
4. Curve fit
5. Optimum Start

M. Mathematical Functions - each controller shall be capable of performing basic mathematical functions (+,-,X,/), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both.

N. The controllers shall be capable of performing complex logical statements including operators such as >,<,=, and,or,exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

O. History Logging - each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 365 days. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32767 values can be stored in each log. Each log shall record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual.

P. It shall be possible to find the average of a log, the standard deviation, the sum, minimum or maximum. It shall also be possible to reference any value within a log for use in a control program.

Q. Reporting - the system shall be able to create user definable reports containing any combination of text and system variables. Report templates will be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.

R. Numerical displays shall be up to 8 digits in total length, with up to 8 digits to the right of the decimal point. The format of each numerical display shall be user definable.

S. Alarming - for each system point, alarms can be created based on high/low limits or conditional expressions. All alarms shall be tested each scan and can result in the display of one or more alarm messages or reports. Messages and reports can be sent to the optional display panel, a local terminal, to the Host Work Station, or via modem to a remote computing device.

T. Overriding Programs - it shall be possible to disable any point in the system and modify it to a user definable value. Any points that have been disabled shall be kept in a log and viewable by an operator at any time.

U. The BAS Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

1.14 OPERATING TERMINALS

A. Portable Operators Terminal (POT) is existing. Update hardware and software as necessary for operation of new BAS.

B. Personal Computer Operator Workstation is existing. Update hardware and software as necessary for operation of new BAS.

1.15 SEQUENCES OF OPERATION

A. Central System Control: All systems and their controllers shall be indexed to heating, cooling, or dehumidification mode of operation and energized per occupancy and equipment operation schedule by the operator workstation, the portable operator's terminal, or the network control panel as scheduled on the drawings and herein specified.

B. For remaining sequences of operation see diagrams on the project's drawings.

1.16 START-UP AND COMMISSIONING

A. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. The installer shall complete all testing, calibrating, adjusting and final field tests. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.

1.17 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration:

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, start-up, and debugging process. The Owner, Architect and Engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. Approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The Contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.
5. As each control setting and action are checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with sequences of operation through all modes of operation.
7. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

END OF SECTION 230900

SECTION 260000 – ELECTRICAL, BASICS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 CONTENTS

A. See Electrical Table of Contents.

1.3 GENERAL

A. Applicable requirements of the Instructions to Bidders and General Conditions of the Contract shall be a part of the Electrical Specifications, and the ELECTRICAL CONTRACTOR (EC) shall examine the general and special conditions before submitting a proposal.

B. The electrical work shall be performed by an EC licensed in the state of North Carolina. The license classification of the EC shall be suitable for the work required for this project.

C. The EC shall assume total responsibility for any portion of the work provided by his subcontractors.

1.4 CODES AND STANDARDS

A. Building Codes:

1. National Fire Protection Association No. 70, National Electrical Code
2. North Carolina State Building Code, Latest Edition and Revisions (NCSBC)
3. National Electrical Safety Code (NESC)
4. National Bureau of Standards (NBS)
5. Local Codes where applicable

B. Industry Standards:

1. Underwriter's Laboratories, Inc. Standards and approved listings (UL)
2. Electrical Testing Laboratories Standards (ETL)
3. National Electrical Manufacturers Association Standards (NEMA)
4. Insulated Power Cable Engineers Association Standards (IPCEA)
5. American National Standards Institute (ANSI)
6. American Society for Testing Materials Standards (ASTM)
7. Canadian Standards Association (CSA)

1.5 SCOPE OF WORK

A. It is the intent and meaning of the drawings and specifications to call for finished work that has been tested and is ready for operation. The EC shall take this into consideration and include in his proposal allowance for contingencies as will allow him to provide minor pieces of materials

and labor not specifically indicated but required for the job to operate properly. This paragraph is intended to insure a complete job will be provided without requests for minor extras.

1.6 RECORD DRAWINGS

A. One set of drawings covering the electrical contract will be provided to the EC to mark all changes, modifications, or revisions effected during construction such that record drawings may be prepared from the information contained thereon upon completion of the work.

B. The EC shall provide photographs of switchboard and panelboards. Photographs shall clearly show equipment designations, manufacturer nameplates, breaker positions, breaker ratings, and directory descriptions.

1.7 APPROVAL OF MATERIALS

A. Construction phase: The CONTRACTOR shall submit his proposal on the specified materials and equipment, or their equivalent, provided the words "or equal" or "or approved equal" follow the named manufacturers. If the above phrases do not appear, the specified manufacturers shall be furnished without substitution. Equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, the ENGINEER being the judge of equality.

B. Where no specific material or equipment type is mentioned, any first class product of a reputable manufacturer may be used provided it conforms to the requirements of the specifications. These materials shall be listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

1.8 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. Unless directed otherwise in the General Provisions and/or Conditions of the Contract, the CONTRACTOR shall submit six (6) sets of shop drawings, certified prints, literature, and cuts to the ENGINEER for all major items of equipment and materials for review and approval. Data required to be as stipulated herein and must be submitted reasonably promptly after material list above has been approved. It is preferred that all electrical submittals for the project shall be submitted at one and the same time.

B. The CONTRACTOR shall analyze all shop drawings before submittal and certify that they meet requirements of Contract Drawings and Specifications. CONTRACTOR Certification shall be in the form of suitable approval stamp placed on each shop drawing submitted for approval.

C. If the ENGINEER deems submittal data is either incomplete or incorrect, one copy will be returned for correction and a new submittal will be required.

D. At least one set of all “approved” shop drawings, certified prints, etc., shall be maintained at the job site and available to representative of the ENGINEER.

E. Approval by the ENGINEER of shop drawings for any materials, apparatus, devices and layouts shall not relieve the CONTRACTOR from the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Such approval shall not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the Contract Documents, the CONTRACTOR shall advise the ENGINEER of the deviations in writing, accompanying the shop drawings, including the reason for the deviations.

F. Physical sizes of equipment used in the design layout are those of reputable equipment manufacturers. The CONTRACTOR is responsible for providing equipment that will fit the space provided. If the CONTRACTOR elects to use other manufacturer’s equipment, any resulting conflicts with space clearance or codes shall be the responsibility of the CONTRACTOR to correct at his expense. The CONTRACTOR assumes all responsibility for providing code clearances.

G. Catalog Data for OWNER:

1. The CONTRACTOR shall provide compilations of catalog data, bound in suitable loose-leaf binders, for each manufactured item of equipment used in the electrical work. These shall be presented to the ENGINEER for transmittal to the OWNER before the final inspection is made. Data shall include printed installation, operation, and maintenance instructions for each item, indexed by product with heavy sheet dividers and tabs. All warranties shall be included with each item. Each manufacturer’s name, address, and telephone number shall be clearly indicated. Generally, shop drawings and submittal data alone are not adequate for catalog data.

H. Record Documents for OWNER:

1. Conductor and cable megger test results.
2. Automatic transfer switch settings.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Electrical drawings and specifications are complementary each to the other, and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment wiring, etc and show the general arrangement of raceways, fixtures, and equipment. Drawings shall be followed as closely as actual building construction and the work of other trades will permit; however, all work shall suit the finished surroundings and/or trim.

B. It shall be understood that where the words “furnish,” “provide,” and/or “install” are used, it is intended that this CONTRACTOR shall purchase and install completely all material necessary and required for this particular item, system, equipment, etc.

C. Any omission from either the drawings or the specifications are unintentional, and it shall be the responsibility of the CONTRACTOR to call to the attention of the ENGINEER any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

D. The electrical work shall conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not practical to indicate offsets, fittings and accessories that may be required. The CONTRACTOR shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the OWNER and as directed by the ENGINEER.

E. Load circuits shall be installed as indicated on the drawings. Circuit number revisions will not be accepted unless approved in writing by the Engineer.

1.10 COORDINATION OF WORK

A. It is understood and agreed that by submitting a bid, the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The CONTRACTOR shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in the other divisions of these specifications. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

B. The CONTRACTOR shall compare the electrical drawings and specifications with the drawings and specifications for other trades, and shall report any discrepancies between them to the ENGINEER and obtain from him written instructions for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the CONTRACTOR shall make proper provisions to avoid interferences in a manner approved by the ENGINEER. All changes required in the work of the CONTRACTOR caused by his neglect to do so shall be made by him at his expense.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The CONTRACTOR shall determine the exact route and location of each electrical raceway prior to make up and assembly.

D. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

E. Offsets and changes in direction of electrical raceways shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The

CONTRACTOR shall furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions.

F. The CONTRACTOR shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The CONTRACTOR shall arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

G. Work in Existing Buildings:

1. Where work may be required to be performed in existing and/or occupied buildings, such work shall be scheduled and arranged to be done at the convenience of the OWNER so as not to interfere with, disrupt, or disturb normal operations in the building. The CONTRACTOR shall obtain written approval from the OWNER before proceeding with work in existing buildings and shall work in existing buildings on schedule as agreed upon with the OWNER. This is not to be necessarily construed to mean that the CONTRACTOR is expected to perform work in existing buildings on holidays, weekends, etc., but that the Contractor must schedule work with the OWNER for the OWNER's beneficial and normal usage of the buildings, and that the CONTRACTOR will be required to maintain the schedule as approved by the OWNER.
2. The CONTRACTOR shall, at all times, provide safety barriers, protective devices, screening, dust barriers, etc., as required to maintain the safety and comfort of the building's personnel and/or occupants in or near his work area.
3. The CONTRACTOR shall be responsible for cleanup in connection with his work in existing buildings. At the end of each working day, all debris, boxes, waste, etc. shall be removed from the buildings and properly disposed of. Equipment, materials, etc. may be left inside the buildings, but such must be properly stored, stacked, and located as approved by the OWNER.
4. The CONTRACTOR shall do all cutting, patching, finishing, repairing, painting, etc., necessary for electrical work to be installed in existing buildings. All finishes shall be left to equal finish and condition prior to cutting. No cutting of structural members will be allowed. All cutting of walls, floors, roofs, etc. shall be repaired and/or replaced to equal finish prior to cutting. The CONTRACTOR shall route conduits and locate equipment as approved by the OWNER and A/E. Routing and locations shall be firmly established and approved before proceeding with any phase of the work.
5. The CONTRACTOR shall be responsible for any and all damage to the existing buildings, grounds, walkways, paving, etc. caused by the work, the CONTRACTOR and/or his personnel, and/or his equipment in the accomplishment of this work. Such damages shall be repaired and/or replaced by the CONTRACTOR at no additional cost to the OWNER, to equal finish prior to damage. The A/E shall be the judge as to equal finishes, etc.
6. Certain power requirements must be met without interruption during certain times on the existing electrical system. It is anticipated that partial power outages will be necessary to accomplish the work covered by these drawings and specifications. The CONTRACTOR shall determine in advance the dates, times and duration of these outages and shall obtain permission from the OWNER to shut down the electric power. Unauthorized power outages will not be tolerated.

H. Electrical Work Coordinated with Other Disciplines:

1. Heating, Ventilating and Air Conditioning Equipment

   a. The EC shall provide a source of power for all mechanical equipment. "Source" shall include conductors, raceways, circuit breakers, junction boxes, panelboards and/or wiring troughs as required by conditions and codes and/or as shown on the contract drawings.
   b. In general, individual disconnecting means for each mechanical equipment unit will be furnished and installed by the Mechanical subContractor. Line side connections shall be made by the EC. All load side wiring will be accomplished by the subMechanical Contractor.

I. Equipment and Materials (General):

1. Materials shall be new and shall bear the manufacturer's name, trade name, and listing label in every case where a standard has been established for the particular material. The equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design.
2. Delivery and Storage

   a. Equipment and materials shall be delivered to the site and stored in original containers inside dry, heated spaces, but readily accessible for inspection by the ENGINEER until installed. Corrosion inhibitors shall be installed in all panelboards, switches, starters and control panels immediately upon receipt. Install one inhibitor for every 8 cubic feet of enclosure volume. Replace inhibitors every 90 days and at final inspection in the ENGINEER's presence. Rusty and/or corroded materials and equipment will be replaced at the direction of the ENGINEER.

3. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
4. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the OWNER in a condition satisfactory to the ENGINEER. Damage or defects, developing before acceptance of the work shall be corrected at the CONTRACTOR's expense.
5. It shall be the responsibility of the CONTRACTOR to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.
6. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The CONTRACTOR shall promptly notify the ENGINEER, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the ENGINEER's written instructions before proceeding with the work. Should the CONTRACTOR perform any work that does not comply with the manufacturer's instructions, recommendations, or requirements; it shall be corrected at the direction of the ENGINEER at no additional cost to the Owner.

J. Sleeves, Inserts, Openings, Etc.:

1. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located, and installed by the EC.

K. Cutting and Patching:

1. The EC shall do all rough cutting and patching as required for the proper installation of work under this contract. Cutting shall be kept to a minimum, and finishes shall be restored to the satisfaction of the Owner and Engineer.

L. Locations and Measurements:

1. Outlets, equipment, and appliances are shown and located on the drawings as accurately as possible. All measurements shall be verified on the project and coordinated with the drawings of other disciplines.

M. Workmanship:

1. Work shall be executed as required by the specifications and the accompanying drawings and shall be done in a workmanlike manner by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

N. Final Inspections and Equipment Demonstrations:

1. For State Construction projects, the State Construction Office is the Authority Having Jurisdiction (AHJ) for the Electrical Inspections on this project. It is the responsibility of the Electrical Contractor to notify the State Property Electrical Inspectors in the Construction Administration Section of the State Construction Office, to schedule the required inspections. No work shall be covered up until after the inspection has been completed and approved by an authorized SCO inspector. Inspections shall be restricted to between Monday through Friday unless authorized otherwise by the State Construction Office. The CONTRACTOR shall provide the Owner two (2) copies of Electrical Inspectors' written reports.
2. The CONTRACTOR shall furnish ladders, required tools, and men to open fixtures, boxes, panels, or any other equipment to enable the ENGINEER representatives to see into any parts of the installation he may request.
3. The CONTRACTOR shall furnish meters for observation of readings as directed by the ENGINEER representative. Meters to be furnished include: clamp-on type ammeter, voltmeter, megger, and clamp-on type ground resistance tester.

O. Operating Instructions:

1. At the completion of the entire installation, the CONTRACTOR shall arrange to operate each component of the system and then the system as a whole. When all the requirements of the plans and specifications have been met, the CONTRACTOR shall then arrange to instruct the OWNER's operating and maintenance personnel in the correct and proper procedures for the operation and maintenance of the systems

END OF SECTION 260000

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SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Cutting and patching for electrical construction.
4. Touchup painting.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Metal Items for Use Outdoors or in Damp Locations: Stainless steel.

B. 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.

C. Raceway: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

D. Expansion Anchors:

1. Inside: Carbon- steel wedge or sleeve type.
2. Outside: Stainless-steel wedge or sleeve type.

E. Toggle Bolts:

1. Inside: All-steel springhead type.
2. Outside: Stainless-steel springhead type.

2.2 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

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

B. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

C. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Selection of Supports: Comply with manufacturer's written instructions.

B. 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.

3.3 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 individual horizontal raceways with separate pipe hangers or clamps.

D. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

E. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of 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.

F. Arrange conductors supports in vertical runs so the weight of conductors is carried entirely by supports, with no weight load on conductor terminals.

G. 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.

H. 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.

I. 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. Steel: Spring-tension clamps on steel.
6. Light Steel: Sheet-metal screws.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.5 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site after coordination with the Owner's representative. Equipment and/or materials that the Owner desires to retain shall be moved to a location designated by the Owner's representative.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.6 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.

3.7 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Touchup painting.

3.8 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

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.

3.9 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 Final Acceptance.

END OF SECTION 260500

SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 POWER CONDUCTORS AND CABLES

A. Manufacturers:

1. Cerro Wire LLC.
2. Colonial Wire and Cable.
3. Encore Wire Corporation.
4. General Cable Corporation.

5. Okonite.
6. Prysmian Group.
7. Republic Wire, Inc.
8. Southwire.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material:

1. Copper complying with NEMA WC70 / ICEA S-95-658 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
2. Power and lighting circuitry: Minimum conductor size shall be #12, and maximum conductor size shall be #500 kcmil.

D. Conductor Insulation Types: Type THHN/THWN-2 complying with NEMA WC70 / ICEA S-95-658.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems.
2. AMP Incorporated/Tyco International.
3. FCI.
4. Greaves Polaris.
5. Hubbell/Anderson.
6. ILSCO.
7. NSI.
8. O-Z/Gedney; EGS Electrical Group LLC.
9. Penn Union.
10. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. For conductors #8 & smaller, use wirenut type twist connectors.
2. For conductors #6 & larger, use pre-insulated solderless connectors with one spare port(s) for future cable connection.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Feeders, Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables, conductors, or raceway.

C. Identify and color-code conductors and cables according to Section "Electrical Identification."

D. Shared neutral conductors shall not be used unless specifically indicated so on homerun circuitry designations on the drawings.

3.3 CONNECTIONS

A. Connect outlet and component connections to wiring systems and to ground. Tighten electrical 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.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Inspect for physical damage; test conductors and cable for continuity and shorts.
3. Megger testing for building wire and cable:

    a. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. Megger testers shall not be electronic type. Megger testers shall be hand crank or power driven crank type. Minimum readings between conductors and between conductor and the grounded metal raceway shall be: 25 mega-ohms for #6 wire and smaller; 50 mega-ohms for #4 wire or larger.
    b. The CONTRACTOR shall correct malfunctioning conductors and cables, including replacement if necessary, and retest to demonstrate compliance.
    c. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. Provide tabulated megger readings for each panel circuit.

C. Witness Tests:

1. The CONTRACTOR shall furnish a megger and show A/E representative and/or Owner that the conductors and panels comply with the above requirements.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

B. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 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.

3.3 INSTALLATION

A. 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.

3.4 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. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. 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.

C. 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.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Section "Basic Materials and Methods" for supports, anchors, and identification products.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. LFMC: Liquidtight flexible metal conduit.

D. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. Alflex Inc.
2. Allied Tube and Conduit.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Conduit Pipe Products Company.
5. Electri-Flex Co.
6. Gibson Stainless.
7. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
8. Manhattan/CDT/Cole-Flex.
9. Maverick Tube.
10. O-Z Gedney; Unit of General Signal.
11. Patriot Aluminum Products.
12. Republic Conduit.
13. Wheatland Tube Co.

B. Rigid Aluminum Conduit: Produced to ANSI C80.5; listed to UL 6A.

C. EMT and Fittings: Produced to ANSI C80.3; listed to UL 797.

D. FMC: Listed to UL 1.

E. LFMC: Listed to UL 360.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco.
4. Cantex.
5. Certainteed.

6. Condux International.
7. ElecSYS.
8. Electri-Flex.
9. Heritage Plastics / Atkore International.
10. Lamson & Sessions; Carlon Electrical Products.
11. Manhattan/CDT/Cole-Flex.
12. Queen City Plastics.
13. RACO.
14. Southern Pipe, Inc.
15. Spiralduct, Inc./AFC Cable Systems, Inc.
16. Thomas & Betts.

B. RNC: Produced to NEMA TC 2; listed to UL 651.

1. Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: Produced to NEMA TC 3; listed to UL 514B; match to conduit or tubing type and material.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Arlington.
2. B-Line.
3. Cooper Crouse-Hinds.
4. Emerson/General Signal; Appleton Electric Company.
5. Erickson.
6. FSR.
7. Hammond.
8. Hoffman.
9. Hubbell.
10. Milbank.
11. O-Z/Gedney.
12. Peerless.
13. RACO.
14. Robroy Industries.
15. Rose + Bopla.
16. Scott Fetzer Co.; Adalet-PLM Division.
17. Spring City Electrical.
18. Strong.
19. Thomas & Betts.
20. Vynckier.
21. Walker Systems.
22. Woodhead Industries.

B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

C. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.5 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid aluminum.
2. Concealed: Rigid aluminum.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. For grounding electrode conductors: RNC Schedule 80.
7. Boxes and Enclosures: NEMA 250, Type 4X stainless steel.

B. Indoors:

1. Exposed, Higher than 10' AFF: EMT.
2. Exposed, Lower than 10' AFF:
    a. In Electrical Rooms: EMT.
    b. Elsewhere: Rigid aluminum.
3. Concealed: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid aluminum conduit.
6. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21).

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

E. Do not install aluminum conduits embedded in or in contact with concrete. For concrete encasement or penetrations, coat conduit with asphaltum or bitumastic type coating.

F. EMT shall not be installed where raceway or fittings would be in direct contact with the earth, underground, in/below concrete, exposed to the elements, exposed to severe physical damage, or exposed to severe corrosive influence.

3.2 INSTALLATION

A. Complete raceway installation before starting conductor installation.

B. Support raceways as specified in Section "Basic Electrical Materials and Methods."

C. Install temporary closures to prevent foreign matter from entering raceways.

D. Protect stub-ups from damage where conduits rise through concrete. Arrange so curved portions of bends are not visible above the finished concrete.

E. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

G. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Conduits installed on the inside face of exterior building walls shall be spaced off the wall surface a minimum of ¼" using strut-type channel or "clamp-backs".

I. Underground raceways:

J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

K. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
3. Where using boxes with concentric, eccentric, or over-sized knockouts; provide bonding bushings and jumpers. Size bonding jumpers in accordance with NEC Table 250-122, connecting to the box with ground lugs.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Flexible Connections:

1. Use maximum of 24 inches of flexible conduit for connections to equipment subject to vibration, noise transmission, or movement; and for all motors.
2. Use LFMC in damp or wet locations.

O. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Final Acceptance.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

1. Exposed threads on galvanized conduits and fittings, installed outdoors, shall be coated with galvanizing paint or equivalent protective coating.

3.5 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section for the installation of underground circuitry. 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. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 260533

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data:

1. For each electrical identification product indicated.
2. For double coated, adhesive tape product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches.

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

2.2 NAMEPLATES AND SIGNS

A. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16” thick for signs up to 20 sq. in. and 1/8” thick for larger sizes.

B. Fasteners for Nameplates and Signs:

1. Two-part epoxy adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Circuit Identification Labels on Boxes: Engraved Plastic Nameplates. Install labels externally.

F. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

G. Color-Coding of Secondary Phase, Neutral, and Ground Conductors: Use the following colors for service, feeder, and branch-circuit phase conductors:

	Configuration	Phase A	Phase B	Phase C	Neutral	Ground
1.	120/240-V, 1 Ph, 3W	Black	Red	N/A	White	Green
2.	120/240-V, 3 Ph, 4W	Black	Orange	Blue	White	Green
3.	120/208-V, 3 Ph, 4W	Black	Red	Blue	White	Green
4.	277/480-V, 3 Ph, 4W	Brown	Orange	Yellow	Gray	Green

5. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 6 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

H. Apply identification to conductors as follows:

1. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
2. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

I. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated or detailed in the drawings, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Attach engraved labels with two-part epoxy adhesive. Apply labels for each unit of the following categories of equipment:

1. Panelboards, electrical cabinets, and enclosures.
2. Disconnect switches.
3. Power transfer equipment.

Nameplate colors shall be:

1. Blue surface with white core for 208/120-V or 120/240-V equipment.

END OF SECTION 260553

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Trim types and details.
c. Bus configuration, current, and voltage ratings.
d. Short-circuit current rating of panelboards and overcurrent protective devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Panelboard Schedules: For installation in panelboards.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. If Section “Operation and Maintenance Data” is included in the project manual, in addition to items there, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are typically based on Square D products. Products of other manufacturers are acceptable if they can be installed in the space indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Electrical outage(s) will be required for this project and will require extensive advance coordination with the Owner for scheduling and functional impacts.
2. Notify Engineer/Owner no fewer than two weeks in advance of proposed interruption of electrical service.
3. Do not proceed with interruption of electrical service without Owner's written permission.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.

c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets, as scheduled in the drawings. NEMA PB 1, Type 1.

1. Front Hinged Trim: Entire front trim hinged to box with full-length piano hinge, and with standard door within hinged trim cover.
2. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
3. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

C. Ground and Neutral Bars:

1. Equipment Ground Bar: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
2. Neutral Bar: Adequate for feeder and branch-circuit neutral conductors.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Mechanical or compression type.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. These locations will be indicated as SPACE on the panel schedules in the drawings.

F. PANELBOARD SHORT-CIRCUIT RATING

G. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 PANELBOARDS

A. Doors: Secured with flush latch with tumbler lock; keyed alike.

B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers. Set field-adjustable circuit-breaker trip ranges.

E. Panel breaker configurations shall be installed as indicated on the panel schedules or as noted. Breaker position revisions will not be accepted unless approved in writing by the Engineer.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification".

B. Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with laminated-plastic nameplate mounted as specified in Section "Electrical Identification".

3.3 CONNECTIONS

A. Ground equipment according to Section "Grounding and Bonding."

B. Connect wiring according to Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.
3. Neutral–ground bond testing: After all fixtures, devices and equipment are installed and all connections completed to each panel, the CONTRACTOR shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and grounded enclosure. If this reading is less than 25 mega-ohms, the CONTRACTOR shall disconnect the branch circuit neutral wires from the neutral bar. The CONTRACTOR shall then test each one separately to the panel until the low reading ones are found. The CONTRACTOR shall correct troubles, re-connect, and re-test until at least 25 mega-ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in manufacturer's installation instructions for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

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SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. HD: Heavy duty.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Operation and Maintenance Data:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Hubbell.
4. Legrand.
5. Siemens Energy & Automation, Inc.
6. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and defeatable door interlocks when the operating handle is in the “ON” position. Short-circuit withstand ratings of 100kA or 200kA require Class R or Class J rejection fuse block feature.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and defeatable door interlocks when the operating handle is in the “ON” position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 4X stainless steel.
2. Indoor Locations: NEMA 250, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in manufacturer's installation instructions for switches and molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

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SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches (ATS), closed transition type with bypass.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
2. Wiring diagrams.

C. Duke Energy interconnection approval.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than three hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled by a third party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment..

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Electrical outage(s) will be required for this project and will require extensive advance coordination with the Owner for scheduling and functional impacts.
2. Notify Engineer/Owner no fewer than two weeks in advance of proposed interruption of electrical service.
3. Do not proceed with interruption of electrical service without Owner's written permission.

1.6 COORDINATION

A. Coordinate size and location of concrete bases.

1. An existing concrete base supports a transfer switch that will be removed. Dependent on new transfer switch dimensions, expand the concrete base as required.
2. Cast anchor-bolt inserts into bases.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Owner Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:

a. Emerson; ASCO Power Technologies, LP.
b. ABB / GE / Zenith Controls.
c. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project, based on testing according to UL 1008.
1. Rating: 22,000 AIC.
2. Normal supply is protected by an existing GE Spectra Series circuit breaker, Cat. No. SKLA36AT6800 with trip unit Type SRPK800A rated 600A.
3. Backup supply is protected by a breaker on a standby generator. Field verify breaker model for coordination of transfer switch short circuit rating requirements.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Switch Action: Double throw; mechanically held in both directions.
2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated for 3-phase distribution systems and three-pole switches are indicated for single phase distribution system, provide neutral pole switched simultaneously with phase poles.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section "Electrical Identification."
1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.

3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

J. Label transfer switch with short circuit current rating information as required by NEC 702.5.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 2 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.
4. Failure of power source serving load initiates automatic break-before-make transfer.
5. See attached Figure 74 from Duke Energy document Requirements for Electric Service and Meter Installations, North Carolina and South Carolina.
    a. Configure reverse power relay to comply with utility company (Duke Energy) interconnection requirements.
    b. Comply with other requirements as detailed in the attached Duke Energy Figure 74.

F. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 2 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.5 REMOTE COMMUNICATIONS SYSTEMS

A. Ethernet Communications Module:

1. Accommodate remote monitoring status of the transfer switch, utility source, and generator source.
2. Web based application for access via PC, tablet, or smart phone.
3. Email notifications of power events and alarm conditions.
4. Connectivity Protocols:

    a. Ethernet.
    b. Modbus.
    c. SNMP.
    d. SMTP.
    e. RS-485.

5. Four Ethernet ports.

B. Field investigate existing generator communication protocol. Provide connectivity between generator and new ATS for generator status monitoring.

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Duke Energy Interconnection Requirements: See attached Figure 74 at the end of this section. Coordinate interconnection requirements with Duke Energy's account representative for the North Carolina State Ports Authority. Submit written confirmation from Duke for connection approval.

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support.

C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Section "Electrical Identification."

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section "Grounding and Bonding."

C. Connect wiring according to Section " Conductors and Cables."

3.3 REMOTE COMMUNICATIONS

A. Configure Ethernet communications module for remote monitoring of transfer switch, utility source status, and generator status.

B. Configure web based application / web page in coordination with the Owner.

C. Configure email notifications of events and alarms in coordination with the Owner.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

INTERCONNECTION EVALUATION

SYSTEMS IN THIS CATEGORY REQUIRE APPROVAL IN WRITING FROM DUKE ENERGY BEFORE BEING CONNECTED. SPECIFICALLY, INTERCONNECTION OF GENERATING FACILITIES IN THIS CATEGORY MUST BE EVALUATED AND APPROVED BY THE DISTRIBUTION PROTECTION AUTOMATION AND CONTROL GROUP WITHIN DUKE ENERGY.

INTERCONNECTION PROTECTION (RELAYING) REQUIREMENTS

FOR INTERCONNECTION PROTECTION, THE GENERATING FACILITY'S INTERCONNECTION EQUIPMENT MUST EITHER BE LISTED AS FULLY COMPLIANT WITH UL1741 (FOR INVERTER-BASED EQUIPMENT) OR MUST BE COMPLIANT WITH IEEE 1547 SECTION 4 (INTERCONNECTION TECHNICAL SPECIFICATIONS AND REQUIREMENTS); VOLTAGE AND FREQUENCY SET-POINTS MUST BE SAME AS "DEFAULT" UNLESS OTHERWISE APPROVED BY DUKE ENERGY. ADDITIONAL REQUIREMENTS ARE LISTED BELOW:

1. THE DER UNIT SHALL PARALLEL WITH THE COMPANY DISTRIBUTION SYSTEM WITHOUT CAUSING A VOLTAGE FLUCTUATION AT THE POD GREATER THAN +/-5% OF THE PREVAILING VOLTAGE LEVEL OF THE COMPANY DISTRIBUTION SYSTEM AT THE POD. (IEEE 1547-2003 SECTION 4.1.3 SYNCHRONIZATION)
2. THE DER UNIT SHALL NOT ENERGIZE THE COMPANY DISTRIBUTION SYSTEM WHEN THE COMPANY DISTRIBUTION SYSTEM IS DE-ENERGIZED. (IEEE 1547-2003 SECTION 4.1.5 INADVERTENT ENERGIZATION OF THE COMPANY DISTRIBUTION SYSTEM)
3. SERVICE ENTRANCE DISCONNECTING EQUIPMENT WITH VISIBLE OPENING CAPABILITY AND GROUNDING PROVISIONS. THIS INCLUDES THE ABILITY TO LOCK OPEN OR "RACK-OUT" THEIR UTILITY BREAKER OR SERVICE ENTRANCE DISCONNECT.
4. THE INTERCONNECTION EQUIPMENT MUST HAVE A SYNCHRONIZATION CHECK FUNCTION (25 RELAY).
5. THE INTERCONNECTION EQUIPMENT MUST HAVE A SEPARATE TIMER THAT WILL INITIATE THE SEPARATION OF THE GENERATOR AND THE UTILITY IF THE PARALLELING TIME EXCEEDS 100MS.
6. THE DER UNIT SHALL NOT BACK FEED (INTENDED OR NON-INTENDED) THE UTILITY SYSTEM.
7. CUSTOMER MUST PROVIDE A DOCUMENT STAMPED BY A LICENSED PROFESSIONAL ENGINEER (LICENSED IN THE STATE WHERE THE GENERATING FACILITY IS TO BE LOCATED) SHOWING APPROVAL OF CUSTOMER'S DESIGN AND TESTING OF SYSTEM OPERATION MEETS DUKE ENERGY REQUIREMENTS FOR MOMENTARY PARALLEL OPERATION.
8. CUSTOMER MUST SIGN AN INTERCONNECTION AGREEMENT BEFORE MOMENTARY PARALLEL OPERATION IS ALLOWED.

DUKE ENERGY.

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STANDBY GENERATION - PROTECTION REQUIREMENTS
MOMENTARY PARALLEL GENERATION
(FAST TRANSITION ≤100 MILLISECONDS PARALLEL TIME)

DEC	DEM	DEP	DEF
X	X	X	X

FIG 74

END OF SECTION 263600

APPENDIX A

NORTH CAROLINA STATE PORTS AUTHORITY

SAFETY AND SECURITY

HOT WORK PERMIT PROCEDURES

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NORTH CAROLINA PORTS

NORTH CAROLINA STATE PORTS AUTHORITY

SAFETY and SECURITY

HOT WORK PERMIT PROCEDURES

December 2016

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HOT WORK PERMIT PROCEDURES

A. PURPOSE:

This program establishes the minimum safe working procedures and guidelines for the operation cutting, welding, brazing, grinding and soldering or any other similar operation throughout the North Carolina State Ports Authority (NCSPA). It also covers the control of ignition sources such as spark-producing tools and devices in hazardous areas. The program meets the basic requirements of the NFPA 51B Standard and federal regulations.

B. SCOPE:

These procedures are intended to protect life, health and property from fire and the products of combustion, which might result from the use of welding and cutting equipment, open flames and ignition sources. All employees of North Carolina State Ports Authority and outside contractors/sellers/service companies involved in the use of flame or spark-producing equipment on NCSPA premises are required to conform to these guidelines.

C. POLICIES AND PROCEDURES:

1. It is the policy at NCSPA that a Hot Work Permit shall be issued by the Port Police Department before conducting any operation involving welding or cutting, or use of flame or spark-producing equipment in the areas not specifically designated for such use.
2. Port Police Department shall be notified in writing by the Project Manager or Contractor Supervisor at least 48 hours in advance of intended hot work operation. A copy of these Hot Work Procedures shall be provided to the contractor at time of notification.
3. In order to obtain a Hot Work Permit:
   a) Contact Port Police and obtain a copy of the NCSPA Hot Work Permit Procedures.
   b) Review the NCSPA Hot Work Procedures and complete the applicable portions of the Hot Work Request and submit the Jobsite Hazard Analysis (JHA) form to the Port Police for review.
   c) Complete a joint safety inspection with the NCSPA Port Police prior to hot work operations.
4. The Hot Work Permit shall be valid for the day and the operation for which it is issued only. Jobs requiring more than one day shall require a separate permit for each day's work.
5. When means other than gas or electric arc cutting or welding can provide equal or superior work quality, the least hazardous means of performing the job should be used.
6. Contractors conducting hot work on NCSPA facilities must supply their own approved Personal Protective Equipement (PPE) and fire extinguishing media suitable for the work being conducted. Proper PPE shall include applicable personal safety gear, precautions, signage, barricades, etc.
7. A minimum of one qualified Fire Watch must be on continuous duty during hot work operations. Additional fire watch persons may be required depending on the nature of hot work operation. This person shall continously monitor the exposed areas to ensure the safety of the operation.

8. The Fire Watch shall have proper fire extinguishing equipment and be trained in its use. Fire extinguisher shall be readily accessible within 30 ft. of location where hot work is performed.
9. The fire watch shall be present for the JHA inspection and the pre-start safety inspection with the Port Police Department.
10. Fire Watches will conduct continuous inspections before, during and after all hot work operations and remain onsite for a minimum of 30 minutes and until the hot work area is cool to the touch.
11. The Fire Watch is responsible for completing the post hot work operation verification on the hot work permit and submitting the permit to Port Police. In every circumstance, the Port Police shall be notified when approved Hot Work operations are complete.
12. A copy of the signed Hot Work Permit shall be posted at the job site and maintained throughout the entire operation.
13. Port Police Department who will maintain a copy of the permit on file for a period of 48 hours after completion of work.
14. Under NO circumstances will hot work in confined spaces or other such hazardous areas be completed unless certified safe by a licensed Marine Chemist.
15. While working in confined spaces certified and approved by a licensed Marine Chemist, a trained Confined Space Response and Rescue Team will be present at the work area.
16. Welding on any vessel is prohibited without prior notification and approval by the US Coast Guard, Captain of the Port (COPT). This includes freight vessels although not required by federal regulations

D. PORT ENGINEERING FACILITIES:

1. Certain areas of maintenance repair shops shall be designated welding areas and comply with the following requirements:
   a) Maintenance and repair personnel shall submit a preliminary Hot Work JHA form to the Port Police Department when requesting a designated hot work area. The Police Department will inspect the area and issue a Hot Work Permit valid for one year. The designated area will be inspected and the permit renewed annually.
   b) A copy of the approved annual permit shall be posted in the work shop area.
   c) Facility maintenance personnel shall be responsible for conducting monthly inspections using the NCSPA Monthly Workspace Safety Inspection Form.
   d) Welding areas shall be cleaned regularly and maintained free of dirt and debris and subject to inspection at any time by Police and Safety personnel.
   e) Designated areas shall be free of combustible materials, including stored materials and construction material components.
   f) The designated area shall remain free of gaseous fuels, hazardous vapors, fumes from liquid fuels or other flammable/combustible liquids and gases.
   g) All welding equipment and PPE shall be regularly inspected, tested and maintained in accordance with the manufactures requirements.

E. LIMITATIONS:

A Hot Work Permit will be issued with the understanding that the welder will **NOT** perform the following activities:

1. Weld when the NCSPA Port Police has not issued an approved permit for Hot Work in a specific area.
2. A pre-work JHA has not been completed.
3. A qualified Fire Watch is not available and/or assigned during the entire operation.
4. Sprinkler protection is impaired. (Unless operation requires securing of automatic sprinkler systems).
5. Appropriate fire extinguisher equipment is not serviceable and readily available.
6. Explosive, flammable or other hazardous vapors, gases or dusts may be present in the area. Hot Work operations are prohibited port-wide during any ongoing gas freeing operations.
7. There is a potential for heat transfer along or through walls, pipes, tanks or other metal surfaces that may cause ignition or decomposition of ignitable or toxic substances in contact with the metal.
8. There is potential for production of sparks, slag or molten metal by welding or cutting within 100 feet of unprotected combustible or flammable substances that may cause fire.
9. The area is a confined space. All confined space Hot Work operations shall be inspected and certified safe for hot work by a licensed Marine Chemist.
10. If the supervisor, welder, or any member of the Hot Work Team believes that hot work could result in undue hazards of any nature, STOP work immediately, maintain a fire watch, and notify the Port Police.
11. Proper signs and placards are not posted to inform people in the area.
12. Proper engineering controls are not in place to prevent exposure to fumes of adjacent area occupants.
13. Proper barriers are not in place to prevent people from inadvertently entering into the area.

F. GENERAL FIRE SAFETY REQUIREMENTS

1. **Separation from combustibles.**

   Hot work areas shall not be less than 100 feet from combustible materials and combustible waste or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

2. **Openings.**

   Openings or cracks in walls, floors, ducts or shafts within 35 feet of the hot work area shall be tightly covered (with non-combustible materials or sealed) to prevent the passage of sparks to adjacent combustible areas, or shielded by metal fire-resistant guards, or provided with curtains to prevent passage of sparks or slag.

3. **Housekeeping.**

   Combustible waste shall not be allowed to accumulate on floors and other surfaces within the hot work area. Contractors working in hot work permitted areas must regularly clean and lawfully dispose of combustible waste.

4. **Partitions.**

   Partitions segregating hot work areas from other areas of the building shall be of noncombustible construction. Partitions shall prevent the passage of sparks, slag, and heat from the hot work area.

5. **Precautions in hot work.**

   Hot work shall not be performed on a container or equipment that contains or has contained flammable liquids, gases or solids until the container or equipment has been thoroughly cleaned, inerted or purged by qualified and licensed personnel and approved in writing by a certified Marine Chemist.

6. **Sprinkler protection.**

   Sprinkler system protection shall not be shut off or impaired while hot work is performed unless approved by the NCSPA Safety and Security Director. Where hot work is performed close to sprinklers, noncombustible barriers or damp cloth guards shall shield the individual sprinkler heads and shall be removed when the work is completed. If the work extends over several days, the shields shall be removed at the end of each workday.

7. **Construction sites and torch-applied roof systems.**

   A Fire Watch shall be provided for each torch operation at a construction site and in connection with torch applied roofing system operations. A Fire Watch shall be provided for each torch in operation. An additional Fire Watch shall be provided on the floor or level below the torch operation.

8. **Fire detection systems.**
   Approved special precautions shall be taken to avoid accidental operation of automatic fire fighting and detection systems.

G. PRE-HOT WORK JOB HAZARD ANALYSIS FORM

A pre-hot work JHA shall be conducted by the responsible person prior to work to ensure that all equipment is safe and hazards are recognized and protected. A copy of the JHA shall be kept at the work site during the work and made available for inspection. The pre-hot work JHA shall be conducted at least once per day and shall verify the following:

1. Fire Watch personnel are present.
2. All persons performing hot work possess any required certifications.
3. Fire extinguishers are operable and available.
4. The hot work equipment is inspected and in good working order.
5. The hot work area is clear of combustibles and flammable solids or that such materials present in the area at a distance of 100 feet.

6. Exposed construction is of noncombustible materials or, if combustible, is protected.
7. All building exits are clearly marked and unobstructed.
8. Hot work area floors are clear of combustible waste accumulation.
9. Approved actions have been taken to prevent accidental activation of extinguishing and detection equipment in accordance with the ports "Lockout Tag out Procedures".

H. HOT WORK PERMIT:

The attached Hot Work Permit form shall be completed and signed by the Port Police and the welder. A signed copy shall be posted at the work site. Hot Work Permits will be maintained by the NCSPA Police Department for 48 hours from date of permit.

NORTH CAROLINA PORTS

Pre-Hot Work Jobsite Hazard Analysis Form

Instructions:

The Pre-Hot Work Jobsite Hazard Analysis (JHA) must be conducted by the person responsible for conducting the hot work, prior to issuance of permit to ensure that all equipment is safe and hazards are recognized and protected. The JHA must be completed once daily. The Fire Watch is responsible for maintaining the JHA form at the work site and making it available for inspection. This Form must be returned to Port Police and will be maintained on the premises for a minimum of 48 hours after work is complete.

Checklist:

1. **Equipment:**
   a. Available sprinklers, hose streams, and extinguishers are available and operable. ❑ Yes
   b. Approved actions have been taken to prevent accidental operation of automatic fire detection systems. ❑ Yes
   c. Hot work equipment inspected and in good maintenance and repair. ❑ Yes
2. **Requirements within 35 feet of work area:**
   a. Flammable liquids, dust, lint, and oil deposits removed. ❑ Yes
   b. Floor swept clean. ❑ Yes
   c. Combustible floors wet down and or covered with fire-resistant sheet. ❑ Yes
   d. Remove other combustibles where possible. Otherwise protect with fire-resistant cover or metal shields. ❑ Yes
   e. All wall and floor openings covered (ventilation ducts and drains). ❑ Yes
   f. Combustibles on other side of walls moved away. ❑ Yes
3. **Fire Watch/ hot work area monitoring:**
   a. Fire Watch will be provided during, 30 minutes after work, and cool to touch. ❑ Yes
   b. Fire Watch is supplied with fire extinguishers and proper training. ❑ Yes
   c. Fire Watch may be required for adjoining areas and below. ❑ Yes
4. **Permit, Licensing, and Insurance:**
   a. Signed Hot Work Permit on-site and posted. ❑ Yes
   b. Contractors; appropriate licensing and adequate Certificate of Insurance. ❑ Yes

Responsible Person:

Name:_____ Date:____/____/_____

Company:_____ Title: _____

Signature: _____

NORTH CAROLINA PORTS

HOT WORK PERMIT

Fire Department Emergency Phone Number: 911

PLEASE NOTE: Print form, sign and submit to the NCSPA Police Department for approval.

Notification must be made to the Port Police before any welding/cutting operations start. All welding/cutting operations shall be performed in accordance with the requirements established by the Ports Authority Hot Work Fire Prevention Policy, OSHA, and NFPA 51B Standards.

1. A copy of this permit must be on the jobsite until applicable work finish date.
2. Provide a minimum of one (1) 2A 10BC Fire Extinguisher at site.
3. No hot work within one hundred (100) feet of any cargo or combustable material.
4. After hot work has been completed, remain on site for a minimum of thirty (30) minutes and until cool to touch for possible fire hazards.
5. Use shielding or separation in hazardous areas at all times.
6. Follow all Port Authroity rules and requirements of NFPA 51 Standards.
7. JHA must be completed prior to starting Hot Work each day.

Date Work to Begin	Today's Date	Intended Date of Completion / Expiration
Project Name		
Contractor Name	Contractor's Emergency Contact Name and Number	
Supervisor / Foreman	Cell	Fax
Office Telephone	Hours of Hot Operation	
Location of Site where work is to be performed *(please note building and floor if applicable)*		
Description of work to be performed		
Equipment to be used		
Fire System Shutdown Required		

Person(s) Performing Hotwork	Name of Firewatch *(Cannot be same as person(s) perfoming work)*
Fire Watch Completed *(Date & Time)*	Signature of Firewatch at Completion
Police Department Representative Name and Date	Contractors On-Site Supervisors Name and Date
Police Department Representatives Signature	Contractors On-Site Supervisors Signature