

# PROJECT MANUAL

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UNIVERSITY OF NORTH CAROLINA  
AT WILMINGTON  
HOUSING VILLAGE PHASE 3  
601 SOUTH COLLEGE ROAD  
WILMINGTON, NORTH CAROLINA 28403  
EARLY PROCUREMENT PACKAGES

5142301800 / SCO 22-29053-02A

OCTOBER 06, 2025



DOCUMENT 00 01 07 - SEALS PAGE

This document includes the Professional Seals of Design Professionals responsible for preparing the Construction Documents.

ARCHITECTURAL:

SEAL LOCATION:

NAME:

Eric Schoenage

(Print)

Eric Schoenage

(Signature)

58

(Professional Number)



STRUCTURAL:

SEAL LOCATION:

NAME:

Carl Schuett

(Print)



(Signature)

47005

(Professional Number)



PLUMBING:

SEAL LOCATION:

NAME:

James Currie

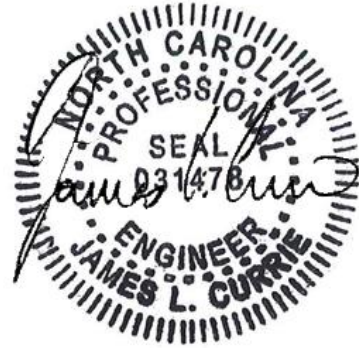
(Print)



(Signature)

031478

(Professional Number)



MECHANICAL:

SEAL LOCATION:

NAME:

James Currie

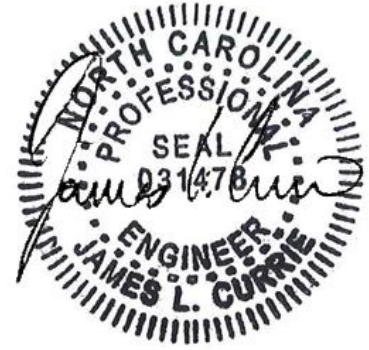
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(Signature)

031478


(Professional Number)



ELECTRICAL:

SEAL LOCATION:

NAME: Steve Robey  
(Print)

  
(Signature)

043650  
(Professional Number)



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END OF SECTION 00 01 10

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SECTION 00 65 36 - CONTRACTOR'S GENERAL WARRANTY

UNIVERSITY OF NORTH CAROLINA AT WILMINGTON  
HOUSING VILLAGE PHASE 3  
601 SOUTH COLLEGE ROAD  
WILMINGTON, NORTH CAROLINA 28403

The undersigned Contractor hereby warrants, in accordance with the applicable provisions and terms set forth in the Contract Documents, all materials and workmanship incorporated in this Project against any and all defects due to faulty materials or workmanship or negligence for a period of 12 months, or such longer periods as set forth in the Contract Documents, from the effective date of Final Acceptance. This Contractor further warrants all work incorporated in this Project to remain leakproof and watertight at all points as applicable for a period of 24 months from the effective date of Final Acceptance.

This Warranty shall be binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God or other casualty beyond the control of the Contractor.

This Warranty shall be in addition to other warranties and guarantees set forth in the Contract Documents, and shall not act to constitute a waiver of additional protection of the Owner afforded, where applicable, by consumer protection and product liability provisions of law, and these stipulations shall not constitute waiver of any additional rights or remedies available to the Owner under the law.

Signed: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

(Corporate Seal)

Subscribed and sworn before me this  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Notary Public)

END OF SECTION 00 65 36

October 06, 2025

University of North Carolina at Wilmington  
Housing Village Phase 3  
Early Procurement Packages

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October 06, 2025

University of North Carolina at Wilmington  
Housing Village Phase 3  
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SECTION 00 65 37 - ASBESTOS-FREE WARRANTY

UNIVERSITY OF NORTH CAROLINA AT WILMINGTON  
HOUSING VILLAGE PHASE 3  
601 SOUTH COLLEGE ROAD  
WILMINGTON, NORTH CAROLINA 28403

The undersigned Contractor hereby warrants that no asbestos-containing materials of any kind were used in the construction of University of North Carolina at Wilmington Housing Village Phase 3, 601 South College Road, Wilmington, North Carolina 28403.

Signed: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

(Corporate Seal)

Subscribed and sworn before me this  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Notary Public)

END OF SECTION 00 65 37

October 06, 2025

University of North Carolina at Wilmington  
Housing Village Phase 3  
Early Procurement Packages

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**GENERAL CONDITIONS OF THE CONTRACT**

**STANDARD FORM FOR CONSTRUCTION MANAGER-AT-RISK PROJECTS**

**NORTH CAROLINA**

**DEPARTMENT OF ADMINISTRATION**

**STATE CONSTRUCTION OFFICE**

**Form OC-15CM**

**This document is intended for use on State capital construction projects and shall not be used on any project that is not reviewed and approved by the State Construction Office. Extensive modification to the General Conditions by means of “Supplementary General Conditions” is strongly discouraged. State agencies and institutions may include special requirements in “Division 1 – General Requirements” of the specifications, where they do not conflict with the General Conditions.**

**Second Edition January 2013**

**Revision 1 – May 2024: Article 23.b**

## GENERAL CONDITIONS OF THE CONTRACT

The use or reproduction of this document or any part thereof is authorized for and limited to use on projects of the State of North Carolina, and is distributed by, through and at the discretion of the State Construction Office, Raleigh, North Carolina, for that distinct and sole purpose.

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## ARTICLE 1 - DEFINITIONS

- a. The **contract documents** consist of the Request for Proposal (RFP); Construction Manager's formal response to the RFP; 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 contract; the performance bond; the payment bond; insurance certificates; the approval of the attorney general; and the certificate of the Office of State Budget and Management. All of these items together form the contract.
- b. The **Owner** is the State of North Carolina by and through the agency or institution named in the contract..
- c. The **designer** or **project designer** means the firm or firms of architects or engineers or both (and their consultants) which have undertaken to design the project pursuant to a contract with the Owner, (hereinafter, the "design contract").
- d. The **Construction Manager-at-Risk (CM) accepts a relationship of trust and confidence between himself and the Owner and undertakes to act as the Owner's fiduciary in the handling and opening of bids in accordance with the provisions of North Carolina General Statute (N.C.G.S.) 143-128.1**. The CM agrees to furnish his best skills and his best judgment to cooperate with the Owner and Designer for undertaking all necessary action contemplated under the contract documents to (a) establish during the design phase a Guaranteed Maximum Price (GMP) to construct the project and (b) ensure timely and quality completion of the project at a cost within the GMP. Construction Manager or CM as used in the contract documents means Construction Manager-at-Risk (CM at Risk).
- e. A **subcontractor**, as the term is used herein, shall be in the case of a principal trade contractor, a general, mechanical, electrical or plumbing contractor or in the case of a specialty contractor, a trade contractor who is not a principal trade contractor, who has entered into a direct contract with a CM, and includes one who furnishes materials worked to a special design in accordance with plans and specifications covered by the contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.
- f. **Written notice** shall be defined as notice in writing delivered in person to the contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization by registered mail.
- g. **Work**, as used herein as a noun, is intended to include materials, labor, and workmanship of the appropriate contractor as supervised by the CM.
- h. The **project** is the total construction work to be performed under the contract documents.
- i. **Construction Management Fee** shall be an all inclusive lump sum management fee which will include all Construction Manager-at-Risk home office, project site and project related costs including all Construction Manager-at-Risk overhead costs and profit.
- j. **Change order**, as used herein, shall mean a written order to the CM subsequent to the signing of the contract authorizing a change in the GMP contract. The change order shall be signed by the CM, designer and the Owner, and approved by the State Construction Office, in that order (Article 19).

- k. **Field Order**, as used herein, shall mean a written approval for the CM to proceed with the work requested by Owner prior to issuance of a formal Change Order. The field order shall be signed by the CM, designer, Owner, and State Construction Office (SCO).
- l. **Field Change**, as used herein shall mean a written approval from the Owner for the CM to proceed with work requested by the Owner to be paid for from the CM Contingency or Owner's Project Reserve within the GMP.
- m. **Time of Completion**, as stated in the contract documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article 23).
- n. **Liquidated damages**, as stated in the contract documents, is an amount reasonably estimated in advance to cover the consequential damages associated with the Owner's economic loss in not being able to use the Project for its intended purposes at the end of the contract's completion date as amended by change order, if any, by reason of failure of the CM to complete the work within the time specified. Liquidated damages does not include the Owner's extended contract administration costs (including but not limited to additional fees for architectural and engineering services, testing services, inspection services, commissioning services, etc.), such other damages directly resulting from delays caused solely by the CM, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused solely by the CM (e.g., if a multi-phased project-subsequent phases, delays in start of other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).
- o. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the CM, and which engages to be responsible for the CM and his acceptable performance of the work.
- p. **Routine written communications between the Designer and the Construction Manager** are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, or facsimile. Such communications cannot be identified as "request for information".
- q. **Clarification or Request for information (RFI)** is a request from the CM seeking an interpretation or clarification by the Designer relative to the contract documents. The RFI, which shall be labeled (RFI), shall clearly and concisely set forth the issue or item requiring clarification or interpretation and why the response is needed. The RFI must set forth the CM's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.
- r. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work.
- s. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.
- t. **"Equal to" or "approved equal"** shall mean materials, products, equipment, assemblies, or installation methods considered equal by the bidder in all characteristics (physical, functional, and aesthetic) to those specified in the contract documents. Acceptance of equal is subject to approval of the designer and owner.

- u. **“Substitution” or “substitute”** shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified, but which in the opinion of the bidder would improve competition and/or enhance the finished installation. Acceptance of substitution is subject to the approval of the designer and owner.
- v. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.
- w. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.
- x. **Special inspector** is one who inspects materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and referenced standards.
- y. **Commissioning** is a quality assurance process that verifies and documents that building components and systems operate in accordance to the owner’s project requirements and the project design documents.
- z. **Designer Final Inspection** is the inspection performed by the design team to determine the completeness of the project in accordance with approved plans and specifications. This inspection occurs prior to SCO final inspection.
- aa. **SCO Final Inspection** is the inspection performed by the State Construction Office to determine the completeness of the project in accordance with NC Building Codes and approved plans and specifications.
- bb. **Beneficial Occupancy** is requested by the owner and is occupancy or partial occupancy of the building after all life safety items have been completed as determined by the State Construction Office. Life safety items include but not limited to fire alarm, sprinkler, egress and exit lighting, fire rated walls, egress paths and security.
- cc. **Final Acceptance** is the date in which the State Construction Office accepts the construction as totally complete. This includes the SCO Final Inspection and certification by the designer that all punch lists are completed.

## ARTICLE 2 - 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. The wording of the specifications shall be interpreted in accordance with common usage of the language except that words having a commonly used technical or trade meaning shall be so interpreted in preference to other meanings.

- c. The CM shall execute each copy of the response to RFP, contract, performance bond and payment bond as follows:
  1. If the documents are executed by a sole Owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
  2. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.
  3. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
  4. If the documents are made by a joint venture, they shall be executed by each member of the joint venture in the above form for sole Owner, partnership or corporation, whichever form is applicable to each particular member.
  5. All signatures shall be properly witnessed.
  6. If the construction manager's license is held by a person other than an Owner, partner or officer of a firm, then the licensee shall also sign and be a party to the contract. The title "Licensee" shall appear under his/her signature.
  7. The bonds shall be executed by an attorney-in-fact. There shall be attached to each copy of the bond a certified copy of power of attorney properly executed and dated.
  8. Each copy of the bonds shall be countersigned by an authorized individual agent of the bonding company licensed to do business in North Carolina. The title "Licensed Resident Agent" shall appear after the signature.
  9. The seal of the bonding company shall be impressed on each signature page of the bonds.
  10. The CM's signature on the performance bond and the payment bond shall correspond with that on the contract.

### **ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS**

- a. In such cases where the nature of the work requires clarification by the designer, such clarification shall be furnished by the designer with reasonable promptness by means of written instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of contract documents, and shall become a part thereof.
- b. The CM and the Designer shall prepare, if deemed necessary, a schedule fixing dates upon which foreseeable clarifications will be required. The schedule will be subject to addition or change in accordance with progress of the work. The Designer shall furnish drawings or clarifications in accordance with that schedule. The CM shall not proceed with the work without such detail drawings and/or written clarifications.

### **ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS**

The Designer or owner shall furnish free of charge to the CM electronic copies of plans and specifications. If requested by the CM, up to 30 paper copies of plans and specifications will be

provide free of charge,, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the CM shall clearly and legibly record all work-in-place that is at variance with the contract documents. Additional sets shall be furnished at cost, including mailing, to the CM at the request of the CM.

#### **ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA**

- a. Within fifteen (15) consecutive calendar days of the notice to proceed, a schedule for anticipated submission of all shop drawings, product data, samples, and similar submittals shall be prepared by the CM and provided to the designer. This schedule shall indicate the items, relevant specification sections, other related submittal data, and the date when these items will be furnished to the designer.
- b. The CM shall review, approve and submit to the Designer all Shop Drawings, Coordination Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Required Submittals shall bear the CM's stamp of approval, any exceptions to the Contract Documents shall be noted on the submittals, and copies of all submittals shall be of sufficient quantity for the Designer to retain up to three (3) copies of each submittal for his own use plus additional copies as may be required by the CM. Submittals shall be presented to the Designer in accordance with the schedule submitted in paragraph (a). so as to cause no delay in the activities of the Owner.
- c. The Designer shall review required submittals promptly, noting desired corrections if any, and retaining three (3) copies (1 for the Designer, 1 for the owner and 1 for SCO) for his use. The remaining copies of each submittal shall be returned to the CM not later than twenty (20) days from the date of receipt by the Designer, for the CM's use or for corrections and resubmittal as noted by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittals.
- d. Approval of shop drawings by the designer shall not be construed as relieving the CM from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the shop drawings, unless such error has been called to the attention of the designer in writing by the CM.

#### **ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE**

- a. The CM shall maintain, in readable condition at his job office, 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 Designer or his authorized representative, owner or State Construction Office.
- b. The CM shall maintain at the job office, 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 CM and submitted to the designer upon project completion and no later than thirty (30) days after acceptance of the project.
- c. The contractor shall maintain at the job office a record of all required tests that have been performed, clearly indicating the scope of work inspected and the date of approval or rejection.

## **ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS**

All drawings and specifications are instruments of service and remain the property of the Owner. The use of these instruments on work other than this contract without permission of the Owner is prohibited. All copies of drawings and specifications other than contract copies shall be returned to the Owner upon request after completion of the work.

## **ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES**

- a. The CM shall, unless otherwise specified, supply & pay for all lighting, power, heat, sanitary facilities & water and shall require the Principal Trade and Specialty Contractors to, supply and pay for all labor, transportation, materials, tools, apparatus, scaffolding and incidentals necessary for the completion of his work, and to 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. The CM 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 there from, 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 CM shall furnish evidence from the the Principal Trade and Specialty Contractors as to quality of materials.
- d. 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 CM through the Principal Trade or Specialty Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the CM through the Principal Trade or Specialty Contractor has the option of using any product and manufacturer combination listed. However, the CM through the Principal Trade or Specialty 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. The CM shall be responsible for reviewing all substitution requests from Principal Trade or Specialty Contractors prior to submission to the Project Designer and Owner and shall track & monitor all such requests. Requests for substitution of materials, items, or equipment shall be submitted to the Project Designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and the owner approves.
- e. The CM shall obtain written approval from the designer for the use of products, materials, equipment, assemblies or installation methods claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered.

- f. The Designer is the judge of equality for proposed substitution of products, materials or equipment.
- g. If at any time during the construction and completion of the work covered by these contract documents, the conduct of any workman of the various crafts be adjudged a nuisance to the Owner or Designer, or if any workman be considered detrimental to the work, the CM shall order such parties removed immediately from grounds.

## **ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS**

It is the intention of the contract documents that the work covered herein will not constitute in any way infringement of any patent whatsoever unless the fact of such patent is clearly evidenced herein. The CM shall protect and save harmless the Owner against suit on account of alleged or actual infringement. The CM shall pay all royalties and/or license fees required on account of patented articles or processes, whether the patent rights are evidenced hereinafter.

## **ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS**

- a. The CM shall 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 CM observes that the drawings and specifications are at variance therewith, he shall promptly notify the Designer in writing. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the CM performs any work or authorizes any work to be performed knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising there from. Additional requirements implemented after bidding will be subject to equitable negotiations.
- b. All work under this contract shall conform to the North Carolina State Building Code and other State, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the CM unless otherwise specified.
- c. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to inspection by any county or municipal authorities and are not subject to county or municipal building codes. The CM shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.
- d. Projects involving local funding (Community Colleges) are also subject to county and municipal building codes and inspection by local authorities. The CM shall pay the cost of these permits and inspections unless otherwise specified.

## **ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC**

- a. The CM shall be responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the Owner or designer, and by laws or ordinances governing such conditions. The CM shall be responsible for any damage to the Owner's property or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. The CM shall be responsible for and pay for any damages caused to the Owner. The CM shall have access to the project at all times.

- b. The CM shall be responsible to 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. 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.
- d. The CM shall ensure that all trees and shrubs designated to remain in the vicinity of the construction operations are protected in accordance with the requirements of the plans and specifications. All walks, roads, etc., shall be barricaded 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 CM shall develop and implement a project safety plan that provides 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. The CM shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. The CM shall insure that protection is provided against damage or injury resulting from falling materials and that all protective devices and signs be maintained throughout the progress of the work.
- f. The CM 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 N.C.G.S. 95-126 through 155.
- g. The CM shall designate a responsible person of his organization as safety officer/inspector to inspect the project site for unsafe health and safety hazards, to report these hazards to the contractor for correction, and whose duties also include accident prevention on the project, and to provide other safety and health measures on the project site as required by the terms and conditions of the contract. The name of the safety inspector shall be made known to the designer and owner at the time of the preconstruction conference and in all cases prior to any work starting on the project.
- h. In the event of an emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the CM 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 CM on account of such action shall be determined as provided for under Article 19(b).
- i. 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.

## **ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973**

- a. Any land-disturbing activity performed by the CM or any Principal Trade or Specialty Contractor in connection with the project shall comply with all erosion control measures set

forth in the contract documents and any additional measures which may be required in order to ensure that the project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C).

- b. Upon receipt of notice that a land-disturbing activity is in violation of said act, the CM shall be responsible for ensuring that all steps or actions necessary to bring the project in compliance with said act are promptly taken.
- c. The CM shall be responsible for defending any legal actions instituted pursuant to N.C.G.S. 113A-64 against any party or persons described in this article.
- d. To the fullest extent permitted by law, the CM shall indemnify and hold harmless the Owner, the designer and the agents, consultants and employees of the Owner and designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of work or failure of performance of work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article.

#### **ARTICLE 13 - INSPECTION OF THE WORK**

- a. It is a condition of this contract that the work shall be subject to inspection during normal working hours by the designer, designated official representatives of the Owner, State Construction Office and those persons required by state law to test special work for official approval. The CM shall therefore provide safe access to the work at all times for such inspections.
- b. All instructions to the CM will be made only by or through the designer or his designated project representative. Observations made by official representatives of the Owner shall be conveyed to the designer for review and coordination prior to issuance to the CM.
- c. The CM shall perform quality control inspections on the work of Principal Trade and Specialty Contractors to guard the Owner against defects and deficiencies in the work and shall coordinate this activity with the on-site duties of the Project Designer. The CM shall advise the Project Designer of any apparent variation and/or deviation from the intent of the Contract Documents and shall take the necessary action to correct such variations and deviations.
- d. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. The CM shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first re-inspection all costs associated with additional re-inspections shall be borne by the CM.
- e. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the CM shall give adequate notice to the Project Designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the Project Designer. Such special tests or inspections will be made in the presence of the Project Designer, or his authorized representative, and it shall be the CM's responsibility to serve ample notice of such tests.

- f. All laboratory tests shall be paid by the Owner unless provided otherwise in the contract documents except the CM shall pay for laboratory tests to establish design mix for concrete and for additional tests to prove compliance with contract documents where materials have tested deficient except when the testing laboratory did not follow the appropriate ASTM testing procedures.
- g. Should any work be covered up or concealed prior to inspection and approval by the Project Designer and/or (SCO) such work shall be uncovered or exposed for inspection, if so requested by the Project Designer or SCO in writing. Inspection of the work will be made promptly upon notice from the CM. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the CM.

#### **ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE**

- a. On-site representatives of the CM shall manage the work of the Principal Trade and Specialty Contractors and coordinate the work with the activities of the Owner and Project Designer to complete the project with the Owner's objectives of cost, time and quality. Throughout the progress of the work, the CM shall maintain a competent and adequate full-time staff approved by the Owner and Project Designer. It is understood that the designated and approved on-site representative of the CM will remain on the job and in responsible charge as long as those persons remain employed by the CM unless otherwise requested or agreed to by the Owner. The CM shall establish an on-site organization with appropriate lines of authority to act on behalf of the CM. Instructions, directions or notices given to the designated on-site authority shall be as binding as if given to the CM. However, directions, instructions, and notices shall be confirmed in writing.
- b. The CM shall examine and study the drawings and specifications and fully understand the project design, and shall provide constant and efficient supervision to the work. Should he discover any discrepancies of any sort in the drawings or specifications, he shall report them to the designer without delay. He will not be held responsible for discrepancies in the drawings and/or specifications, but shall be held responsible to report them should they become known to him.
- c. The CM shall call and preside over monthly job site progress conferences. All Principal Trade and Specialty Contractors shall be represented at these job progress conferences by both home office and project personnel. The CM shall require attendance from other subcontractors and material suppliers who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the project on schedule and to complete the project within the specified contract time. The CM shall be prepared to assess progress of the work and to recommend remedial measures for correction of progress as may be appropriate. The CM with assistance from the Designer shall be the coordinator of the conferences and shall preside as chairman. The CM shall turn over a copy of his daily reports to the Designer and Owner at the job site progress conference. Owner will determine daily report format.
- d. The CM shall employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a bench mark nearby in a location where same will not be disturbed and where direct instruments sights may be taken.

- e. Prior to bidding, it shall be the responsibility of the CM to prepare an electronic and paper copy of a preliminary critical path method (CPM) schedule and submit such schedule to the Project Designer for his review and comment in sufficient time to allow revisions prior to inserting said schedule into the Principal Trade and Specialty Contractors' bid packages. After contract award but prior to thirty (30) days from the date of the notice to proceed, the CM shall obtain from the Principal Trade and Specialty Contractors their respective work activities and integrate them into a project construction schedule in CPM form. The resulting CPM schedule shall show all salient features of the work required for construction of the project from start to finish within the time allotted by the contract. The time in days between the CM's early completion date and the contractual completion date is project float time and shall be used as such by the CM unless amended by change order. The CM shall submit to the Project Designer an electronic and paper copy of the final CPM schedule after contracts are executed but within fifteen (15) days prior to the written notice to proceed. The Project Designer after reviewing and commenting on the project CPM schedule shall submit it to the Owner for approval. No application for payment will be processed until the project CPM schedule is approved by the Owner. No monthly application for payment will be processed without the submission of an electronic and paper copy of the CPM schedule attached.
- f. The CPM schedule shall be a complete computer generated network analysis showing the complete sequence of construction activities, identifying the work of separate stages and other logically grouped activities, indicating early and late start and early and late finish dates, float duration and a complete logic. Monthly updates will show the estimated completion of each activity.
- g. The CM shall distribute to the principal trade and specialty contractors the approved project CPM schedule and shall display same at the job site.
- h. The CM shall maintain the project CPM schedule, making monthly adjustments, updates, corrections, etc., which are necessary to finish the project within the time allotted by the contract. In doing so, the CM shall keep the designer as well as all Principal Trade and Specialty Contractors fully informed as to all changes and updates to the schedule. The CM shall submit to the Project Designer a monthly report of the status of all work activities. The monthly status report shall show the actual work completed to date in comparison with the original amount of work scheduled. If the work is behind schedule, the CM must indicate in writing what measures are being taken to bring the work back on schedule and ensure that the contract completion date is not exceeded. If the work is greater than thirty (30) days behind schedule and no legitimate requests for time extensions are in process, then the CM shall prepare and submit to the Project Designer a recovery schedule for review and approval. Failure of the CM to abide by the directives in this paragraph will give the Owner cause to exercise the remedies set forth in Article 29 of the General Conditions and pursue any other legal remedies allowed it by law.

**ARTICLE 15 – {NOT USED}**

**ARTICLE 16 - PRINCIPAL TRADE AND SPECIALTY CONTRACTS AND CONTRACTORS**

- a. Principal Trade and Specialty Contractors shall be pre-qualified by the CM. The prequalification criteria shall be determined by the Owner and CM to address quality, performance, the time specified in the bids for performance of the contract, the cost of construction oversight, time for completion, capacity to perform, and any other factors deemed appropriate by the Owner and/or CM. Basic qualification information from Principal Trade and Specialty Contractors shall be requested on the standard State of North Carolina

Prequalification Form approved by the State Building Commission. Only pre-qualified contractors are allowed to bid to and contract with the CM on a project.

- b. All bids for Principal Trade and Specialty Contracts shall be publically advertised and shall be opened publically in a public venue, and once opened, shall be public records under N.C.G.S. 132. The CM shall award the contract to the lowest responsible, responsive bidder, taking into consideration quality, performance, the time specified in the bids for performance of the contract, the time for completion, compliance with N.C.G.S. 143-128.2, and other factors deemed appropriate by the Owner and advertised as part of the bid solicitation. When contracts are awarded pursuant to this section, the Owner shall provide for a dispute resolution procedure as provided by N.C.G.S. 143-128(f1). Once Principal Trade and Specialty Contractors are in place, the CM shall provide copies of the contracts to the Project Designer and also provide a list of equipment and material suppliers.
- c. A CM may perform a portion of the work only if (a) bidding produces no responsible, responsive bidder for that portion of the work, or (b) the lowest responsible, responsive bidder will not execute a contract for the bid portion of the work, or the Principal Trade or Specialty Contractor defaults and a prequalified replacement cannot be obtained in a timely manner, and (c) the Owner approves performance of the work by the CM.
- d. The Designer will furnish to any Principal Trade or Specialty Contractor, upon request, evidence regarding amounts of money paid to the CM on account of the work of the Principal Trade or Specialty Contractor.
- e. The CM is and remains fully responsible for his own acts or omissions as well as those of any Principal Trade or Specialty Contractor or of any employee of either. The CM agrees that no contractual relationship exists between the Principal Trade and Specialty Contractors and the Owner in regard to the contract, and that the Principal Trade and Specialty Contractors act on this work as an agent or employee of the CM.

## **ARTICLE 17 - CONSTRUCTION MANAGER AND SUBCONTRACTOR RELATIONSHIPS**

The CM agrees that the terms of these contract documents shall apply equally to each Principal Trade and Specialty Contractor as to the CM, and the CM agrees to take such action as may be necessary to bind each Principal Trade and Specialty Contractor to these terms. The CM further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to CM-subcontractor relationships, and that payments to Principal Trade and Specialty Contractors shall be made in accordance with the provisions of N.C.G.S. 143-134.1 titled "Interest on final payments due to prime contractors: payments to subcontractors".

- a. On all public construction contracts which are let by a board or governing body of the state government or any political subdivision thereof, except contracts let by the Department of Transportation pursuant to N.C. G.S. 136-28.1, the balance due the CM shall be paid in full within 45 days after respective prime contracts of the project have been accepted by the Owner, certified by the architect, engineer or designer to be completed in accordance with terms of the plans and specifications, or occupied by the Owner and used for the purpose for which the project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting engineer in charge of the project determines that delay in completion of the project in accordance with terms of the plans and specifications is the fault of the CM, the project may be occupied and used for the purposes for which it was constructed without payment of any interest on amounts withheld past the 45 day limit. Should final

payment to the CM beyond the date such contracts have been certified to be completed by the Project Designer, accepted by the Owner, or occupied by the Owner and used for the purposes for which the project was constructed, be delayed by more than 45 days, said CM shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due the CM during construction shall be paid in accordance with the payment provisions of the contract documents or said CM shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the contract. Funds for payment of such interest on state-owned projects shall be obtained from the current budget of the owning department, institution or agency. Where a conditional acceptance of a contract exists, and where the Owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

- b. Within seven days of receipt by the CM of each periodic or final payment, the CM shall pay the Principal Trade and Specialty Contractors based on work completed or service provided under their contract with the CM. Should any periodic or final payment to a Principal Trade or Specialty Contractor be delayed by more than seven days after receipt of periodic or final payment by the CM, the CM shall pay the Principal Trade or Specialty Contractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due.
- c. The percentage of retainage on payments made by the CM to the Principal Trade and Specialty Contractors shall not exceed the percentage of retainage on payments made by the Owner to the CM. Any percentage of retainage on payments made by the CM to the Principal Trade or Specialty Contractors that exceeds the percentage of retainage on payments made by the Owner to the CM shall be subject to interest to be paid by the CM to the Principal Trade or Specialty Contractor at the rate of one percent (1%) per month or fraction thereof.
- d. Nothing in this section shall prevent the CM at the time of application and certification to the Owner from withholding application and certification to the Owner for payment to a Principal Trade or Specialty Contractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of the Principal Trade or Specialty Contractor to make timely payments for labor, equipment and materials; damage to CM or another subcontractor; reasonable evidence that a Principal Trade or Specialty Contract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by Owner.

## **ARTICLE 18 - DESIGNER'S STATUS**

- a. The Project Designer shall provide liaison and necessary inspection of the work to ensure compliance with plans and specifications. He is the agent of the Owner only for the purpose of constructing this work and to the extent stipulated in the contract documents. He has authority to stop work or to order work removed, or to order corrections of faulty work where such action may be necessary to assure successful completion of the work.
- b. The Project Designer is the impartial interpreter of the contract documents, and, as such, he shall exercise his powers under the contract to enforce faithful performance by both the Owner and the CM, taking sides with neither.

- c. Should the Project Designer cease to be employed on the work for any reason whatsoever, then the Owner shall employ a competent replacement who shall assume the status of the former Project Designer.
- d. The Project Designer will make periodic inspections of the project at intervals appropriate to the stage of construction. He will inspect the progress, the quality and the quantity of the work.
- e. The Project Designer and the Owner shall have access to the work whenever it is in preparation and progress during normal working hours. The CM shall provide facilities for such access so the Designer may perform his functions under the contract documents.
- f. Based on the Project Designer's inspections and evaluations of the project, the Project Designer shall issue interpretations, directives and decisions as may be necessary to assist the CM in the administration of the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract. The CM's decisions, however, relating to means and methods, and administration of the contracts the CM holds are final.

## **ARTICLE 19 - CHANGES IN THE WORK**

- 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 CM 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 or written field order from the designer, countersigned by the owner and the state construction office authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed.

A field order, transmitted by fax or hand- delivered, may be used where the change involved impacts the critical path\_of the work. A formal change order shall be issued as expeditiously as possible.

The CM may be requested to make a change to the work by the Project Designer and Owner where such work is to be funded by the CM Contingency or Project Reserve that is part of the GMP contract. Such a change must be documented in the same manner as a Change Order and must be authorized in writing by the Project Designer and Owner by a Field Change document.

In the event of emergency endangering life or property, the CM may be directed to proceed on a time and material basis whereupon the CM shall proceed and keep accurately on such form as may be required, 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 "c(1)" or Method "c(2)" or both.

- c. In determining the values of changes, either additive or deductive, the CM and Principal Trade and Specialty 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, 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 in 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 c2 herein. If neither party elects to proceed under c2, 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.
- d. Under Paragraph "b" and Methods "c(2)" above, the allowances for overhead and profit combined for a Principal Trade or Specialty Contractor and all multi-tier subcontractors shall not exceed fifteen percent (15%) of **net cost** of the work. No allowance for overhead and profit will be allowed for the CM until the change orders aggregate to a sum in excess of five percent (5%) of the Cost of the Work portion of the GMP. Once this threshold is met the CM may add an overhead & profit allowance not to exceed four percent (4%) of the net cost of the change order. Change orders to the GMP which authorize additional phases of a project without a change in scope of the originally intended project will not be considered in establishing the threshold for additional CM overhead & profit. Under Method "c (1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.
- e. 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 project;
  2. The actual costs of labor expended on the project site;
  3. 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;
  4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the project;
  5. The actual costs of premiums for bonds, insurance, permit fees and sales or use taxes related to the project.

Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the Owner.

- f. 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 breakdown showing method of arriving at net cost as defined above.

- g. In all change orders, the procedure will be for the Project Designer to request proposals for the change order work in writing. The CM will require the Principal Trade and Specialty Contractors to provide such proposals and supporting data in suitable format and will review and approve such change orders prior to submission to the designer. The Project Designer shall verify correctness. Within fourteen (14) days after receipt of the CM's proposal, the Project Designer shall prepare the change order and forward to the CM for his signature or otherwise respond, in writing, to the CM's proposal. Within seven (7) days after receipt of the change order executed by the CM, the Project 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 and forward to the State Construction Office for final approval, within seven (7) days of receipt. The State Construction Office shall act on the change order within seven (7) days. Upon approval by the State Construction Office, one copy remains with the State Construction Office, and the remaining copies are sent to the Project Designer for distribution to the Owner(s), CM and the surety. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or field orders approved by all parties, then shall be substantiated in writing as outlined under normal procedure.
- h. At the time of signing a change order, the CM 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."
- i. 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.
- j. If, during the progress of the work, the Owner requests a change order and the CM's terms are unacceptable, the Owner, with the approval of the State Construction Office, may require the CM to perform such work on a time and material basis in accordance with paragraph "b" 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.

## **ARTICLE 20 - CLAIMS FOR EXTRA COST**

- a. Should the CM consider that as a result of any instructions given in any form by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The CM shall not proceed with the work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article 19(b) and Article 11(h). No claims for extra compensation will be considered unless the claim is so made. The Designer shall render a written decision within seven (7) days of receipt of claim.
- b. The CM shall not act on instructions received by him from persons other than the Project Designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The Project Designer will not be responsible for misunderstandings claimed by the CM of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the

contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.

- c. Should a claim for extra compensation that complies with the requirements of (a) above by the CM be denied by the Project Designer or Owner, and cannot be resolved by a representative of the State Construction Office, the CM may request a mediation in connection with N.C.G.S. 143-128(f1) in the dispute resolution rules adopted by the State Building Commission (1 N.C.A.C. 30H .0101 through .1001). If the CM is unable to resolve its claims as a result of mediation, then the CM may pursue his claim in accordance with the provisions of N.C.G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner, and the following:
  1. A CM who has not completed a contract with a state agency or institution for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the Director of the State Construction Office of the Department of Administration for the amount the CM claims is due. The Director may deny, allow or compromise the claim, in whole or in part. A claim under this subsection is not a contested case under N.C.G.S. Chapter 150B.
  2. (a) A CM who has completed a contract with a State agency or institution for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the Director of the State Construction Office of the Department of Administration for the amount the CM claims is due. The claim shall be submitted within sixty (60) days after the CM receives a final statement of the board's disposition of his claim and shall state the factual basis for the claim.
    - (b) The Director shall investigate a submitted claim within ninety (90) days of receiving the claim, or within any longer time period upon which the Director and the CM agree. The CM may appear before the Director, either in person or through counsel, to present facts and arguments in support of his claim. The Director may allow, deny or compromise the claim, in whole or in part. The Director shall give the CM a written statement of the Director's decision on the CM's claim.
    - (c) A CM who is dissatisfied with the Director's decision on a claim submitted under this subsection may commence a contested case on the claim under Chapter 150B of the General Statutes. The contested case shall be commenced within sixty (60) days of receiving the Director's written statement of the decision.
    - (d) As to any portion of a claim that is denied by the Director, the CM may, in lieu of the procedures set forth in the preceding subsection of this section, within six (6) months of receipt of the Director's final decision, institute a civil action for the sum he claims to be entitled to under the contract by filing a verified complaint and the issuance of a summons in the Superior Court of Wake County or in the superior court of any county where the work under the contract was performed. The procedure shall be the same as in all civil actions except that all issues shall be tried by the judge, without a jury.

## **ARTICLE 21 - MINOR CHANGES IN THE WORK**

The Project Designer will have the authority to order minor changes in the work not involving an adjustment in the contract sum or time for completion, and not inconsistent with the intent of the contract documents. Such changes shall be effected by written order, copied to the State Construction Office, and shall be binding on the Owner and the CM.

## **ARTICLE 22 - UNCORRECTED FAULTY WORK**

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the Owner and the Project Designer, the Owner shall be reimbursed by the CM. A change order will be issued to reflect a reduction in the contract sum.

## **ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME**

- a. The final completion date will be as determined by the Owner, Designer and CM during the pre-construction phase of the project and will be incorporated into the contract for construction services between the Owner and the CM.
- b. The CM shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the Project Designer and shall fully complete all work hereunder within the time of completion specified. For each day in excess of the above number of days, the CM shall pay the Owner the sum stated as liquidated damages reasonably estimated in advance to cover the loses to be incurred by the Owner by reason of failure of the CM to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof. Should the work be delayed by both the owner and contractor, liquidated damages shall be apportioned to reflect the delays of each party. In the case of concurrent delays, contractor caused delays shall be accounted for before owner and designer caused delays.
- c. If the CM is delayed at any time in the progress of his work by any act or negligence of the Owner or the Project Designer, or by any employee of either; by changes ordered in the work; by labor disputes at the project site; by abnormal weather conditions not reasonably anticipated for the locality where the work is performed; by unavoidable casualties; by any causes beyond the contractor's control; or by any other causes which the designer and Owner determine may justify the delay, then the contract time may be extended by change order for the time which the designer and Owner may determine is reasonable.

Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the CM reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, 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. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

- d. Request for extension of time shall be made in writing to the designer, copies to the owner and SCO, within twenty (20) days following cause of delay. In case of continuing cause for delay, the CM shall notify the designer copies to the owner and SCO, of the delay within twenty (20) days of the beginning of the delay and only one claim is necessary.
- e. The CM shall notify his surety in writing of extension of time granted.
- f. No claim shall be allowed on account of failure of the Project Designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. See Article 5c. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

#### **ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY**

- a. The Owner may desire to occupy or utilize all or a portion of the project when the work is substantially complete.
- b. Should the owner request a utilization of a building or portion thereof, the designer shall perform a designer final inspection of area after being notified by the contractor that the area is ready for such. After the contractor has completed designer final inspection punch list and the designer has verified, then the designer shall schedule a beneficial occupancy inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office. If beneficial occupancy is granted by the State Construction Office, in such areas the following will be established:
  - 1. The beginning of guarantees and warranties period for the equipment necessary to support. in the area.
  - 2. The owner assumes all responsibilities for utility costs for entire building.
  - 3. Contractor will obtain consent of surety.
  - 4. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.
- c. The Owner shall have the right to exclude the CM from any part of the project which the Project Designer has so certified to be substantially complete, but the Owner will allow the CM reasonable access to complete or correct work to bring it into compliance with the contract.
- d. Occupancy by the Owner under this article will in no way relieve the CM from his contractual requirement to complete the project within the specified time. The contractor will not be relieved of liquidated damages because of beneficial occupancy. The designer may prorate liquidated damages based on the percentage of project occupied.

#### **ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT**

- a. Upon notification from the CM that the project is complete and ready for inspection, the Project Designer shall make a designer final inspection to verify that the project is complete and ready for SCO final inspection. Prior to SCO final inspection, the CM shall ensure that all items requiring corrective measures noted at the designer final inspection are complete.

The Project Designer shall schedule an SCO final inspection at a time and date acceptable to the Owner, the CM and the State Construction Office.

- b. At the SCO final inspection, the designer and his consultants shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the SCO final inspection, the designer and State Construction Office representative shall make the following determinations:
  - 1. That the project is completed and accepted.
  - 2. That the project is accepted subject to the correction of the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of SCO final inspection or the Owner may invoke Article 28, Owner's Right to Do Work.
  - 3. That the project is not complete and another date for a final inspection will be established.
- c. Within fourteen (14) days of acceptance per Paragraph c1 or within fourteen (14) days after completion of punch list per Paragraph c2 above, the Project Designer shall certify the work and issue applicable certificate(s) of compliance.
- d. Any discrepancies listed or discovered after the date of SCO final inspection and acceptance under Paragraphs c1 or c2 above shall be handled in accordance with Article 42.
- e. The date of acceptance will establish the following:
  - 1. The beginning of guarantees and warranties period.
  - 2. The date on which the CM's insurance coverage for public liability, property damage and builder's risk may be terminated.
  - 3. That no liquidated damages (if applicable) shall be assessed after this date.
  - 4. The termination date of utility cost to the CM (if applicable).
- f. **Prior to issuance of final acceptance date, the contractor shall have his authorized representatives visit the project and give full instructions to the designated personnel regarding operating, maintenance, care, and adjustment of all equipment and special construction elements. In addition, the contractor shall provide to the owner a complete instructional video (media format acceptable to the owner) on the operation, maintenance, care and adjustment of all equipment and special construction elements.**

#### **ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT**

- a. Any work, materials, fabricated items or other parts of the work which have been condemned or declared not in accordance with the contract by the designer shall be promptly removed from the work site by the CM, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the Owner. Work or property of the Owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the CM.
- b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the Project Designer, and shall make satisfactory progress until completed.

- c. Should the CM fail to proceed with the required corrections, then the Owner may complete the work in accordance with the provisions of Article 28.

#### **ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT**

See Article 35, Performance Bond and Payment Bond, and Article 42, Guarantee. Neither the final certificate, final payment, occupancy of the premises by the Owner, nor any provision of the contract, nor any other act or instrument of the Owner, nor the Project Designer, shall relieve the CM from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. The CM shall correct or make good any defects due thereto and repair any damage resulting therefrom, which may appear during the guarantee period following final acceptance of the work except as stated otherwise under Article 42, Guarantee. The Owner will report any defects as they may appear to the CM and establish a time limit for completion of corrections by the CM. The Owner will be the judge as to the responsibility for correction of defects.

#### **ARTICLE 28 - OWNER'S RIGHT TO DO WORK**

If, during the progress of the work or during the period of guarantee, the CM 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 CM 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 CM, such action and cost of same having been first approved by the Project Designer. Should the cost of such action of the Owner exceed the amount due or to become due the CM, then the CM or his surety, or both, shall be liable for and shall pay to the Owner the amount of said excess.

#### **ARTICLE 29 - ANNULMENT OF CONTRACT**

If the CM fails to begin the work under the contract within the time specified or fails to establish a GMP or obtain bids from or enter into contracts with qualified Principal Trade or Specialty Contractors within the GMP, or the progress of the work is not maintained on schedule, or the work is not completed within the time above 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 CM 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 CM and his surety of such delay, neglect or default, specifying the same, and if the CM within a period of seven(7) 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 surety shall fail to take over the work to be done under this contract within seven(7) 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 CM, 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 CM and surety. 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 CM, then the said CM and surety 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 CM and the surety shall be liable and shall pay to the Owner the amount of said excess.

### **ARTICLE 30 – CONSTRUCTION MANAGER’S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT**

- a. Should the work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three months, due to cause beyond the fault or control of the CM, or if the Owner should fail or refuse to make payment on account of a certificate issued by the designer within forty-five (45) days after receipt of same, then the CM, after fifteen (15) days' written notice sent by certified mail, return receipt requested, to the Owner and the designer, may suspend operations on the work or terminate the contract.
- b. The Owner shall be liable to the CM for the cost of all materials delivered and work performed on this contract plus ten (10) percent overhead and profit and shall make such payment. The designer shall be the judge as to the correctness of such payment.

### **ARTICLE 31 - REQUEST FOR PAYMENT**

- a. Not later than the fifth day of the month, the CM shall submit to the designer a request for payment for work done during the previous month. The request shall be in the form agreed upon between the CM and the designer, but shall show substantially the value of work done and materials delivered to the site during the period since the last payment, and shall sum up the financial status of the contract with the following information:
  1. Total of contract including change orders.
  2. Value of work completed to date.
  3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the CM's work has been satisfactorily completed on schedule, with approval of the owner and the State Construction Office and written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule.
  4. Less previous payments.
  5. Current amount due.
- b. Prior to submitting the first payment request, the CM shall prepare a schedule showing a breakdown of the contract price into values of the various parts of the GMP contract. The Cost of the Work breakdown will be arranged so as to facilitate payments to the Principal Trade and Specialty Contractors in accordance with Article 17. The combined CM Construction Management Fee, Bonds & Insurance, CM Contingency, and Project Reserve (if any) will be shown on the Schedule of values as separate lines. The values for the CM Contingency and Project Reserve (if any) will move to appropriate lines within the Cost of the Work as those funds are committed and expended. This schedule of values will be submitted to & approved by the designer and Owner within 30 days of the Notice to Proceed.

The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the designer and Owner may require.

- c. Applications for payment shall be in a form agreed upon by the CM, designer and Owner and shall be prepared and supported by such data to substantiate the accuracy of the request as the designer may require.
- d. Subject to other provisions of the contract documents, the amount of each progress payment shall be computed as follows:
  - 1. Take that portion of the GMP properly allocable to completed work as determined by multiplying the percentage completion of each portion Cost of the Work by the share of the GMP allocated to that portion of the work in the schedule of values.
  - 2. Add that portion of the GMP properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the work or if approved in advance by the Owner, suitably stored off site at a location agreed upon in writing.
  - 3. Subtract the aggregate of previous payments made by the Owner.
  - 4. Subtract the amount, in any, by which the CM has been previously overpaid, as evidenced by the Owner's review of the CM's documentation.
  - 5. Subtract amounts, if any, for which the Project Designer has withheld or nullified a certificate of payment.
  - 6. Subtract retainage as per paragraph (h) below.
  - 7. Add the amount due for the CM Construction Management Fee calculated on the basis of the percentage completion of the project or on a schedule of payment negotiated with the Owner less fifteen percent (15%) and less previous payments for CM Construction Management Fee.
- e. Payment allocated to Principal Trade and Specialty Contractors shall be subject to five percent (5%) retainage, provided, however that after fifty percent (50%) of the Cost of the Work has been satisfactorily completed on schedule, with the approval of the Owner and the State Construction Office and with written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule. The balance of the CM Construction Management Fee shall be held by the Owner until satisfactory completion and close out of the project. Satisfactory completion and close out of the project means that the Owner and Project Designer are satisfied that the project has been completed in accordance with the plans and specifications and within the GMP, all general conditions of the contract pertaining to close out have been satisfied, and all Principal Trade and Specialty Contractors have satisfactorily completed their respective contracts. No retainage will be held for the cost of Bonds and Insurance
- f. When payment is made on account of stored materials and equipment, such materials must be stored on the owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the owner's title to such materials and equipment. Such payments will be made only for materials that have been customized or fabricated specifically for this project. Raw materials or commodity products including but not limited to piping, conduit, CMU, metal studs and gypsum board may not be submitted. Responsibility for such stored materials and equipment shall remain with the CM regardless

of ownership title. Such stored materials and equipment shall not be removed from the owner's property. Should the space for storage on-site be limited, the CM, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the CM desire to include any such materials or equipment in his application for payment, they must be stored in the name of the owner in an independent, licensed, bonded warehouse approved by the designer, owner and the State Construction Office and located as close to the site as possible. The warehouse selected must be approved by the CM's bonding and insurance companies; the material to be paid for shall be assigned to the owner and shall be inspected by the designer. Upon approval by the designer, owner and SCO of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the CM. Such stored materials and equipment shall not be moved except for transportation to the project site. Under certain conditions, the designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the designer, the owner and the State Construction Office prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the State absolute right to possession of the materials at anytime. Bond, security and insurance protection shall continue to be the responsibility of the CM.

- g. In the event of beneficial occupancy, retainage of funds due the CM may be reduced with the approval of the State Construction Office to an equitable amount to cover the list of items to be completed or corrected. Retainage may not be reduced to less than two and one-half (2 1/2) times the estimated value of the work to be completed or corrected. Reduction of retainage must be with the consent and approval of the CM's bonding company.

#### **ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT**

- a. Within five (5) days from receipt of request for payment from the CM, the designer shall issue and forward to the Owner a certificate for payment. This certificate shall indicate the amount requested or as approved by the designer. If the certificate is not approved by the designer, he shall state in writing to the CM and the Owner his reasons for withholding payment.
- b. No certificate issued or payment made shall constitute an acceptance of the work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the Owner except:
  - 1. Claims arising from unsettled liens or claims against the CM.
  - 2. Faulty work or materials appearing after final payment.
  - 3. Failure of the contractor to perform the work in accordance with drawings and specifications, such failure appearing after payment.
  - 4. As conditioned in the performance bond and payment bond.
- c. The making and acceptance of final payment shall constitute a waiver of all claims by the CM except those claims previously made and remaining unsettled (Article 20(c)).
- d. Prior to submitting request for final payment to the designer for approval, the CM shall fully comply with all requirements specified in the "project closeout" section of the specifications. These requirements include but not limited to the following:
  - 1. Submittal of Product and Operating Manuals, Warranties and Bonds, Guarantees, Maintenance Agreements, As-Built Drawings, Certificates of Inspection or Approval

from agencies having jurisdiction. (The designer must approve the Manuals prior to delivery to the Owner).

2. Transfer of required attic stock material and all keys in an organized manner.
  3. Record of Owner's training.
  4. Resolution of any final inspection discrepancies.
  5. Granting access to Contractor's records, if Owner's internal auditors have made a request for such access pursuant to Article 52.
- e. The CM shall forward to the designer, the final application for payment along with the following documents:
1. List of minority business subcontractors and material suppliers showing breakdown of contracts amounts and total actual payments to subcontractors and material suppliers.
  2. Affidavit of Release of Liens.
  3. Affidavit from CM of payment to material suppliers and subcontractors. (See Article 36).
  4. Consent of Surety to Final Payment.
  5. Certificates of state agencies required by state law.
- f. The designer will not authorize final payment until the work under contract has been certified by Project Designer, certificates of compliance issued, and the CM has complied with the closeout requirements. The designer shall forward the CM's final application for payment to the Owner along with respective certificate(s) of compliance required by law.

### **ARTICLE 33 - PAYMENTS WITHHELD**

- a. The designer with the approval of the State Construction Office may withhold payment for the following reasons:
1. Faulty work not corrected.
  2. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.
  3. To provide for sufficient contract balance to cover liquidated damages that will be assessed against the CM.
- b. The Secretary of the Department of Administration may authorize the withholding of payment for the following reasons:
1. Claims filed against the CM or evidence that a claim will be filed.
  2. Evidence that Principal Trade or Specialty Contractors have not been paid.

- c. The Owner may withhold all or a portion of CM's Project Management Fee costs set forth in the approved schedule of values, if CM has failed to comply with: (1) a request to access its records by Owner's internal auditors pursuant to Article 52; (2) a request for a plan of action and/or recovery schedule under Article 14.j or provide The Owner; (3) a request to provide an electronic copies of Contractor's baseline schedule, updates with all logic used to create the schedules in the original format of the scheduling software; and (4) Contractor's failure to have its Superintendent on the Project full-time.
- d. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the CM without cause will make owner liable for payment of interest to the CM in accordance with G.S. 143-134.1. As provided in G.S.143-134.1(e) the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

### **ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS**

The work under this contract shall not commence until the CM has verified to the Owner that all required insurance and verifying certificates of insurance have been obtained and approved in writing by the Owner. These certificates shall contain a provision that coverage's afforded under the policies will not be cancelled, reduced in amount or coverage's 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.

#### **a. Worker's Compensation and Employer's Liability**

The CM shall ensure that it and all Principal Trade and Specialty Contractors shall provide and maintain, during the life of the contract, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of \$100,000.

#### **b. Public Liability and Property Damage**

The CM shall ensure that it and all Principal Trade and Specialty Contractors shall provide and maintain, during the life of the contract, 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.

#### **c. Property Insurance (Builder's Risk/Installation Floater)**

The CM shall ensure that it and all Principal Trade and Specialty Contractors shall purchase and maintain property insurance during the life of this contract, upon the entire work at the

site to the full insurable value thereof. This insurance shall include the interests of the Owner, the CM, and subcontractors in the work and shall insure against the perils of fire, extended coverage, and vandalism and malicious mischief. If the Owner is damaged by failure of the CM to purchase or maintain such insurance, then the CM shall bear all reasonable costs properly attributable thereto; the CM 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.

**d. Deductible**

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the CM and/or the Principal Trade or Specialty Contractor as applicable.

**e. Other Insurance**

The CM shall ensure that it and all Principal Trade and Specialty Contractors 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.

**f. Proof of Carriage**

The CM shall ensure that it and all Principal Trade and Specialty Contractors shall furnish the Owner with satisfactory proof of carriage of the insurance required before written approval is granted by the Owner.

## **ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND**

- a. The CM 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, which shall be in the amount of the GMP for the entire project. Bonds shall be executed in the form bound with the specifications
- b. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina.

## **ARTICLE 36 - CONTRACTOR'S AFFIDAVIT**

The final payment of retained amount due the CM on account of the contract shall not become due until the CM has furnished to the Owner through the designer an affidavit signed, sworn and notarized to the effect that all payments for materials, services or subcontracted work to Principal Trade and Specialty Contractors in connection with his contract have been satisfied, and that no claims or liens exist against the CM in connection with this contract. In the event that the CM cannot obtain similar affidavits from the Principal Trade and Specialty Contractors to protect the CM and the Owner from possible liens or claims against the subcontractor, the CM shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the CM's) knowledge, and if any appear afterward, the CM shall save the Owner harmless.

## **ARTICLE 37 - ASSIGNMENTS**

The CM shall not assign any portion of this contract nor subcontract in its entirety. Except as may be required under terms of the performance bond or payment bond, no funds or sums of money due or become due the CM under the contract may be assigned.

### **ARTICLE 38 - USE OF PREMISES**

- a. The CM shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the designer and shall not exceed those established limits in his operations.
- b. The CM shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- c. The CM shall enforce the designer's and owner's instructions regarding signs, advertisements, fires and smoking.
- d. No firearms, any type of alcoholic beverages or drugs (other than those prescribed by a physician) will be permitted at the job site.

### **ARTICLE 39 - CUTTING, PATCHING AND DIGGING**

- a. The CM shall ensure that all cutting, fitting or patching that may be required to make the work come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the drawings and specifications for the completed structure, as the designer may direct.
- b. Any cost brought about by defective or ill-timed work shall be borne by the party responsible therefor.
- c. No Principal Trade or Specialty Contractor shall endanger any work of another such contractor by cutting, digging or other means, nor shall he cut or alter the work of any other such contractor without the consent of the designer and the affected contractor(s).

### **ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS**

- a. The CM shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer, and other utility services, which may be necessary and required for completion of the project. If the Owner specifies that the CM is to pay all utilities, any permanent meters installed shall be listed in the CM's name until his work is fully accepted by the Owner. As stipulated in the Supplementary General Conditions, the Owner may: (1) pay utilities cost directly, (2) require the CM to pay all utilities cost, (3) or reimburse the CM for the actual cost of utilities. The Owner or CM, as applicable, may recover actual costs of metered utilities from the responsible party should delays occur in project completion. Coordination of the work of the utility companies during construction is the sole responsibility of the CM.
- b. If applicable Meters shall be relisted in the Owner's name on the day following completion and acceptance of the CM's work, and the Owner shall pay for services used after that date.
- c. Prior to the operation of permanent systems, the CM will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.
- d. The CM shall ensure that the permanent building systems are in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishes of the building. A building shall be considered enclosed and secured when windows, doorways (exterior, mechanical, and

electrical equipment rooms), and hardware are installed; and other openings have protection, which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the CM and the designer. Use of the equipment in this manner shall in no way affect the warranty requirements of the CM.

- e. The CM shall coordinate the work so that the building's permanent power wiring distribution system shall be in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.
- f. The CM shall coordinate the work so that the building's permanent lighting system shall be ready at the time interior painting and finishing begins and shall provide adequate lighting in those areas where interior painting and finishing is being performed.
- g. The CM shall be responsible for his permanently fixed service facilities and systems in use during progress of the work. The following procedures shall be strictly adhered to:
  - 1. Prior to acceptance of work by the State Construction Office, the CM shall coordinate the removal and replacement of any parts of the permanent building systems damaged through use during construction.
  - 2. Temporary filters as recommended by the equipment manufacturer in order to keep the equipment and ductwork clean and free of dust and debris shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the Owner's acceptance of the work.
  - 3. Extra effort shall be maintained to keep the building and the site adjacent to the building clean and under no circumstances shall air systems be operated if finishing and site work operations are creating dust in excess of what would be considered normal if the building were occupied.
  - 4. It shall be understood that any warranty on equipment presented to the Owner shall extend from the day of final acceptance by the Owner. The cost of warranting the equipment during operation in the finishing stages of construction shall be borne by the contractor whose system is utilized.
  - 5. The CM shall ensure that all lamps are in proper working condition at the time of final project acceptance.
- h. The CM shall provide, if required and where directed, a shed for toilet facilities and shall furnish and install in this shed all water closets required for a complete and adequate sanitary arrangement. These facilities will be available to other contractors on the job and shall be kept in a neat and sanitary condition at all times. Chemical toilets are acceptable.
- i. The CM shall, if required by the Supplementary General Conditions and where directed, erect a temporary field office, complete with lights, telephone, heat and air conditioning. A portion of this office shall be partitioned off, of sufficient size, for the use of a resident inspector, should the designer so direct.
- j. On multi-story construction projects, the CM shall either provide or ensure that temporary elevators, lifts, or other necessary special equipment is available for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall either be included in the CM Construction Management Fee or specified as part of the work of a Principal Trade or Specialty Contractor and paid for as a part of the Cost of the Work.

- k. The CM will erect one sign on the project if required. The sign shall be of sound construction, and shall be neatly lettered with black letters on white background. The sign shall bear the name of the project, and the CM's name, and the name of the designer and consultants. Directional signs may be erected on the Owner's property subject to approval of the Owner with respect to size, style and location of such directional signs. Such signs may bear the name of the contractor and a directional symbol. No other signs will be permitted except by permission of the Owner.

#### **ARTICLE 41 - CLEANING UP**

- a. The CM shall ensure that the building and surrounding area is reasonably free from rubbish at all times, and shall remove debris from the site on a timely basis or when directed to do so by the designer. The CM shall provide an on-site refuse container(s) for the use of all Principal Trade and Specialty Contractors. The CM shall ensure that each Principal Trade and Specialty Contractor removes their rubbish and debris from the building on a daily basis. The CM shall ensure that the building is broom cleaned as required to minimize dust and dirt accumulation.
- b. The CM shall provide and maintain suitable all-weather access to the building.
- c. Before final inspection and acceptance of the building, the CM shall ensure that all portions of the work are clean, including glass, hardware, fixtures, masonry, tile and marble (using no acid), clean and wax all floors as specified, and completely prepare the building for use by the Owner, with no cleaning required by the Owner.

#### **ARTICLE 42 - GUARANTEE**

- a. The CM 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 date of final acceptance of the work or beneficial occupancy 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 CM 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 CM, 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 roof, equipment, materials, and supplies shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

#### **ARTICLE 43 - CODES AND STANDARDS**

Wherever reference is given to codes, standard specifications or other data published by regulating agencies including, but not limited to, national electrical codes, North Carolina State Building Codes, federal specifications, ASTM specifications, various institute specifications, etc., it shall be understood that such reference is to the latest edition including addenda published prior to the date of the contract documents.

## ARTICLE 44 - INDEMNIFICATION

To the fullest extent permitted by law, the CM shall indemnify and hold harmless the Owner, the designer and the agents, consultants and employees of the Owner and designer, from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance or failure of performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the CM, the CM's subcontractor, or the agents of either the CM or the CM's subcontractor. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this article.

## ARTICLE 45 - 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 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 and such costs shall be included in the bid proposal from Principal Trade and specialty Contractors and contract sum.
- e. Accounting Procedures for Refund of County Sales & Use Tax

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

CM's performing contracts for state agencies shall ensure that the Principal Trade and Specialty Contractors provide information to allow the CM to give the state agency for whose project the materials, supplies, fixtures and/or equipment was purchased a signed statement containing the information listed in N.C.G.S. 105-164.14(e).

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement from the contractors 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.

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.

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.

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.

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 CM.

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.

#### **ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE**

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.

#### **ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES**

The CM agrees not to discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant is qualified. The CM agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices.

#### **ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)**

The State of North Carolina has attempted to address all asbestos-containing materials that are to be disturbed in the project. However, there may be other asbestos-containing materials in the work areas that are not to be disturbed and do not create an exposure hazard. Construction Managers are reminded of the requirements of instructions under General Conditions of the Contract, titled Examination of Conditions. Statute 130A, Article 19, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* from the State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

#### **ARTICLE 49 - MINORITY BUSINESS PARTICIPATION**

N.C.G.S. 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project and requires documentation of good faith efforts for meeting that goal. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix F are hereby incorporated into and made a part of this contract.

The CM shall identify and define contract packages (the value of which shall total to at least ten percent (10%) of the GMP) that remove barriers to participation commonly experienced by Historically Underutilized Businesses and Minority Business Enterprises as those terms are defined in North Carolina General Statute 143-128.2, hereinafter referred to as Reduced Barrier Packages (RBP). Such contract packages will be submitted to the Owner for review. As an example, RBP's may require no performance or payment bond, or may offer the participation of the CM as a guarantor or surety in the financing of material purchases by the Principal Trade and/or Specialty Contractors, provided that the CM may condition such financing participation upon the

issuance of joint checks or other similar arrangements to allow the CM to verify that timely payments are made to suppliers furnishing credit. The CM may propose other and/or additional provisions for reducing barriers to participation.

The Owner shall require the CM to submit a plan for compliance with N.C.G.S.143-128.2 by approval by the Owner prior to soliciting bids for the Principal Trade and Specialty Contracts. The CM and Principal Trade and Specialty Contractors shall make a good faith effort to recruit and select minority businesses for participation in contracts pursuant to N.C.G.S. 143-128.2.

## **ARTICLE 50 – CONTRACTOR EVALUATION**

The CM's overall work performance on the project shall be fairly evaluated in accordance with the State Building Commission policy and procedures, for determining qualifications to compete for future capital improvement projects for institutions and agencies of the State of North Carolina. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, Construction Manager Evaluation Procedures, is hereby incorporated and made a part of this contract. The Owner may request the CM's comments to evaluate the designer.

## **ARTICLE 51 – GIFTS**

Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor ( i.e. architect, bidder, contractor, construction manager, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any State employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32.

During the construction of the Project, the Contractor is prohibited from making gifts to any of the Owner's employees, Owner's project representatives (architect, engineers, construction manager and their employees), employees of the State Construction Office and/or any other State employee that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

## **ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS**

In accordance with N.C. General Statute 147-64.7, the State Auditor shall have access to Contractor's officers, employees, agents and/or other persons in control of and/or responsible for the Contractor's records that relate to this Contracts for purposes of conducting audits under the referenced statute. 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 loss 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.

## **ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT**

The North Carolina False Claims Act (“NCFCA”), N.C Gen. Stat. § 1-605 through 1-618, applies to this Contract. The Contractor should familiarize itself with the entire NCFCA and should seek the assistance of an attorney if it has any questions regarding the NCFCA and its applicability to any requests, demands and/or claims for payment its submits to the State through the contracting state agency, institution, university or community college.

The purpose of the NCFCA “is to deter persons from knowingly causing or assisting in causing the State to pay claims that are false or fraudulent and to provide remedies in the form of treble damages and civil penalties when money is obtained from the State by reason of a false or fraudulent claim.” (Section 1-605(b).) A contractor’s liability under the NCFCA may arise from, but is not limited to: requests for payment, invoices, billing, claims for extra work, requests for change orders, requests for time extensions, claims for delay damages/extended general conditions costs, claims for loss productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, documentation used to support any of the foregoing requests or claims, and/or any other request for payment from the State through the contracting state agency, institution, university or community college. The parts of the NCFCA that are most likely to be enforced with respect to this type of contract are as follows:

- A “claim” is “[a]ny request or demand, whether under a contract or otherwise, for money or property and whether or not the State has title to the money or property that (i) is presented to an officer, employee, or agent of the State or (ii) is made to a contractor ... if the money or property is to be spent or used on the State's behalf or to advance a State program or interest and if the State government: (a) provides or has provided any portion of the money or property that is requested or demanded; or (b) will reimburse such contractor ... for any portion of the money or property which is requested or demanded.” (Section 1-606(2).)
- "Knowing" and "knowingly." – Whenever a person, with respect to information, does any of the following: (a) Has actual knowledge of the information; (b) Acts in deliberate ignorance of the truth or falsity of the information; and/or (c) Acts in reckless disregard of the truth or falsity of the information. (Section 1-606(4).) Proof of specific intent to defraud is not required. (Section 1-606(4).)
- "Material" means having a natural tendency to influence, or be capable of influencing, the payment or receipt of money or property. (Section 1-606(4).)
- Liability. – “Any person who commits any of the following acts shall be liable to the State for three times the amount of damages that the State sustains because of the act of that person[:] ... (1) Knowingly presents or causes to be presented a false or fraudulent claim for payment or

approval. (2) Knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim. (3) Conspires to commit a violation of subdivision (1), (2) ...” (Section 1-607(a)(1), (2).)

- The NCFCA shall be interpreted and construed so as to be consistent with the federal False Claims Act, 31 U.S.C. § 3729, et seq., and any subsequent amendments to that act. (Section 1-616(c).)

Finally, the contracting state agency, institution, university or community college may refer any suspected violation of the NCFCA by the Contractor to the Attorney General’s Office for investigation. Under Section 1-608(a), the Attorney General is responsible for investigating any violation of NCFCA, and may bring a civil action against the Contractor under the NCFCA. The Attorney General’s investigation and any civil action relating thereto are independent and not subject to any dispute resolution provision set forth in this Contract. (See Section 1-608(a).)

#### **ARTICLE 54 – TERMINATION FOR CONVENIENCE**

- a. Owner may at any time and for any reason terminate CM’s services and work at Owner's convenience. Upon receipt of such notice, CM 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, CM 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 CM as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to CM prior to the date of the termination of this Agreement. CM 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.

STATE OF NORTH CAROLINA  
 COUNTY SALES AND USE TAX REPORT  
 SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: \_\_\_\_\_

Page 1 of \_\_\_\_\_

PROJECT: \_\_\_\_\_

FOR PERIOD: \_\_\_\_\_

	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL FOR COUNTY OF:	TOTAL ALL COUNTIES
CONTRACTOR							
SUBCONTRACTOR(S)*							
COUNTY TOTAL							

\* Attach subcontractor(s) report(s)  
 \*\* Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those building materials, supplies, fixtures and equipment which actually became a part of or annexed to the building or structure. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

\_\_\_\_\_  
 Signed

\_\_\_\_\_  
 Notary Public

My Commission Expires: \_\_\_\_\_

\_\_\_\_\_  
 Print or Type Name of Above

Seal

NOTE:  
 This certified statement may be subject to audit.

STATE OF NORTH CAROLINA  
SALES AND USE TAX REPORT DETAIL

CONTRACTOR: \_\_\_\_\_

Page 2 of \_\_\_\_\_

SUBCONTRACTOR \_\_\_\_\_

FOR PERIOD: \_\_\_\_\_

PROJECT: \_\_\_\_\_

PURCHASE DATE	VENDOR NAME	INVOICE NUMBER	TYPE OF PROPERTY	INVOICE TOTAL	COUNTY TAX PAID	COUNTY OF SALE *
				\$	\$	
				<b>TOTAL:</b>	<b>\$</b>	

\* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.

## **GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS**

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of \$300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

### **SECTION A: INTENT**

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

### **SECTION B: DEFINITIONS**

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
  - a. Black, that is, a person having origins in any of the black racial groups in Africa;
  - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
  - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
  - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
  - e. Female
2. Minority Business - means a business:
  - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
  - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means State and all public subdivisions and local governmental units.
5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.
6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

## **SECTION C: RESPONSIBILITIES**

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
  - a. Monitoring compliance with the program requirements.
  - b. Assisting in the implementation of training and technical assistance programs.
  - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
  - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

- a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
  - (1) Project description and location;
  - (2) Locations where bidding documents may be reviewed;
  - (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
  - (4) Date, time and location of the bid opening.
  - (5) Date, time and location of prebid conference, if scheduled.
- b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

- c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
- d. Reviewing of minority business requirements at Preconstruction conference.
- e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
- f. Provide statistical data and required reports to the HUB Office.
- g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

### 3. Owner

Before awarding a contract, owner shall do the following:

- a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
- b. Attend the scheduled prebid conference.
- c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
  - 1. A description of the work for which the bid is being solicited.
  - 2. The date, time, and location where bids are to be submitted.
  - 3. The name of the individual within the owner's organization who will be available to answer questions about the project.
  - 4. Where bid documents may be reviewed.
  - 5. Any special requirements that may exist.
- d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
- e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
- g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
- h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
- i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

### 4. Designer

Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
- b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
- c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
  - (1) A description of the work for which the subbid is being solicited.
  - (2) The date, time and location where subbids are to be submitted.
  - (3) The name of the individual within the company who will be available to answer questions about the project.
  - (4) Where bid documents may be reviewed.
  - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

**SECTION 4: DISPUTE PROCEDURES**

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

**SECTION 5:** These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: [www.nc-sco.com](http://www.nc-sco.com)

**SECTION 6:** In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

## MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

### APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: <http://www.nc-sco.com>

### MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

**OR**

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

**OR**

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

**The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.**

## **MINIMUM COMPLIANCE REQUIREMENTS:**

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any prebid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- (8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- (10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

**APPENDIX E**

**MBE DOCUMENTATION FOR CONTRACT PAYMENTS**

Prime Contractor/Architect: \_\_\_\_\_

Address & Phone: \_\_\_\_\_

Project Name: \_\_\_\_\_

Pay Application #: \_\_\_\_\_ Period: \_\_\_\_\_

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

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

Date: \_\_\_\_\_ Approved/Certified By: \_\_\_\_\_

Name

\_\_\_\_\_

Title

\_\_\_\_\_

Signature

**SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT**



# State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of \_\_\_\_\_

(Name of Bidder)

Affidavit of \_\_\_\_\_

I have made a good faith effort to comply under the following areas checked:

**Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive.** (1 NC Administrative Code 30 I.0101)

- 1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- 2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- 3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- 6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- 9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- 10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

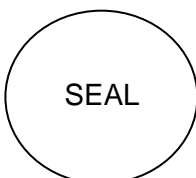
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

**State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract  
with Own Workforce.**

County of \_\_\_\_\_

Affidavit of \_\_\_\_\_

(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the \_\_\_\_\_

\_\_\_\_\_ contract.  
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

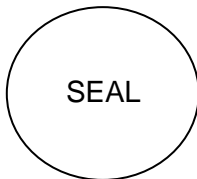
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

# State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of \_\_\_\_\_

**(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)**

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.  
 This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of \_\_\_\_\_ I do hereby certify that on the \_\_\_\_\_  
 (Name of Bidder)

\_\_\_\_\_ (Project Name)  
 Project ID# \_\_\_\_\_ Amount of Bid \$ \_\_\_\_\_

I will expend a minimum of \_\_\_\_\_% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

\*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.**

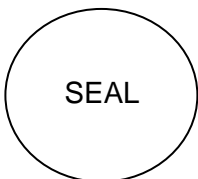
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

# State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of \_\_\_\_\_

**(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)**

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of \_\_\_\_\_ I do hereby certify that on the \_\_\_\_\_  
(Name of Bidder)

Project ID# \_\_\_\_\_ (Project Name) Amount of Bid \$ \_\_\_\_\_

I will expend a minimum of \_\_\_\_\_% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

\*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.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

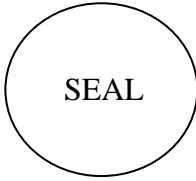
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

## FORM OF PERFORMANCE BOND

Date of Contract: \_\_\_\_\_

Date of Execution: \_\_\_\_\_

Name of Principal  
(Contractor) \_\_\_\_\_

Name of Surety : \_\_\_\_\_

Name of Contracting  
Body : \_\_\_\_\_

Amount of Bond : \_\_\_\_\_

Project \_\_\_\_\_

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 \_\_\_\_\_ 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 : \_\_\_\_\_

Amount of Bond : \_\_\_\_\_

Project \_\_\_\_\_

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 \_\_\_\_\_ counterparts .

Witness :

\_\_\_\_\_  
(Proprietorship or Partnership)

Attest: (Corporation)

By: \_\_\_\_\_

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

\_\_\_\_\_  
Contractor: (Trade or Corporate Name)

By: \_\_\_\_\_

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

\_\_\_\_\_  
(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

# Sheet for Attaching Insurance Certificates

# APPROVAL OF THE ATTORNEY GENERAL

**CERTIFICATION BY THE OFFICE OF STATE  
BUDGET AND MANAGEMENT**

Provision for the payment of money to fall due and payable by the

---

under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

Signed \_\_\_\_\_  
Budget Officer

## SECTION 01 10 00 - 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. Owner-furnished products.
  - 4. Access to site.
  - 5. Work restrictions.
  - 6. Specification and Drawing conventions.

## 1.3 PROJECT INFORMATION

- A Project Identification: University of North Carolina at Wilmington Housing Village Phase 3
  - 1. Project Location: 601 South College Road, Wilmington, North Carolina 28403.
- B Owner: University of North Carolina at Wilmington.
  - 1. Owner's Representative: Kelli Jordan.
- C Architect: Little Diversified Architectural Consulting, 410 Blackwell Street – Suite 10, Durham, North Carolina 27701.
  - 1. Architect's Representative: Eric Schoenagel.
- D Architect's Consultants: The following design professionals have prepared portions of the Contract Documents:
  - 1. Structural: Little Diversified Architectural Consulting.
    - a. Representative: Carl Schuett.
  - 2. Mechanical, Electrical, Plumbing: CMTA.
    - a. Mechanical Representative: Dan Knox.
    - b. Electrical Representative: Jake DeJohn.
    - c. Plumbing: Dan Knox.
  - 3. Civil: CLH design, p.a.
    - a. Representative: Kyle Smith.
  - 4. Landscape: Surface 678.
    - a. Representative: Brian Vaughn.
- E Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
  - 1. See Section 01 31 00 Project Management and Coordination for requirements for using web-based Project software.

## 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A The work of the Project is defined by the Contract Documents and consists of the following:
  - 1. Early procurement packages for construction of a new Student Housing building.
- B Type of Contract:
  - 1. Project will be constructed under a single prime contract.
- C United States Sanctions on Russia: In support of the US Sanctions on Russia, the use of products and materials from Russian companies or companies on Russian sanctions list, or that are associated with the Russian Government, are prohibited from use.

### 1.5 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

### 1.6 ACCESS TO SITE

- A Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits on Use of Site: Confine construction operations to areas indicated.
  - 2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

### 1.7 WORK RESTRICTIONS

- A Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B On-Site Work Hours: Limit work to normal business working hours as required by Authority Having Jurisdiction, Monday through Friday, unless otherwise indicated.
- C Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than 3 days in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Owner not less than 3 days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E Nonsmoking Building: Smoking is not permitted within the building or within 50 feet of entrances, operable windows, or outdoor-air intakes.
- F Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

### 1.8 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 scheduled on the Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 10 00

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## SECTION 01 25 00 - SUBSTITUTION 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 substitutions.

## 1.3 DEFINITIONS

- A Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

## 1.4 ACTION SUBMITTALS

- A Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects, with project names and addresses, and names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with 2018 North Carolina State Building Code.
    - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    - k. Cost information, including a proposal of change, if any, in the Contract Sum.

- I. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
        - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

### 1.5 QUALITY ASSURANCE

- A Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### 1.6 PROCEDURES

- A Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

### 1.7 SUBSTITUTIONS

- A Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B Substitutions for Convenience: Architect will consider requests for substitution if received prior to the opening of bids. Requests received within 30 days after the Notice to Proceed may be considered or rejected at discretion of Architect, request received after that time will be rejected.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 25 00

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# SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase)

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
 \_\_\_\_\_  
 From: \_\_\_\_\_  
 To: \_\_\_\_\_ Date: \_\_\_\_\_  
 \_\_\_\_\_  
 A/E Project Number: \_\_\_\_\_  
 Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_  
 Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_  
 Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_  
 Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

History:  New product  1-4 years old  5-10 years old  More than 10 years old

Differences between proposed substitution and specified product: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: \_\_\_\_\_  
 \_\_\_\_\_

### Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
 Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
 \_\_\_\_\_ Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work:  No  Yes; explain \_\_\_\_\_  
 \_\_\_\_\_

Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time:  No  Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports  \_\_\_\_\_

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## SECTION 01 26 00 - CONTRACT MODIFICATION 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 handling and processing Contract modifications.

## 1.3 MINOR CHANGES IN THE WORK

- A Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

## 1.4 PROPOSAL REQUESTS

- A Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use forms acceptable to Architect.
- B Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
  1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include costs of labor and supervision directly attributable to the change.
  5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
- C Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A Unit-Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

END OF SECTION 01 26 00

## SECTION 01 29 00 - 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 items required to be indicated as separate activities in Contractor's construction schedule. Include 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 Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- 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. Name of Architect.
    - c. Architect's Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. 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. Round dollar amounts to whole dollars, with total equal to Contract Sum.
      - 1) Labor.
      - 2) Materials.
      - 3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
4. 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. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
5. 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.
6. 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.
7. 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.
8. 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 Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Final Acceptance, 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.
  1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect 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.
- E Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F Transmittal: Submit signed and notarized original copies of each Application for Payment to Architect 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.
- G Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H 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 (final).
  4. Products list (final).
  5. Sustainable design action plans, including preliminary project materials cost data.
  6. Schedule of unit prices.
  7. Submittal schedule (final).
  8. List of Contractor's staff assignments.
  9. List of Contractor's principal consultants.
  10. Copies of building permits.
  11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  12. Initial progress report.
  13. Report of preconstruction conference.
  14. Certificates of insurance and insurance policies.
  15. Performance and payment bonds.
  16. Data needed to acquire Owner's insurance.
- I Application for Payment at Final Acceptance: After Architect issues the Certificate of Final Acceptance, 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 Final Acceptance issued previously for Owner occupancy of designated portions of the Work.

- J 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.
  5. AIA Document G706A.
  6. AIA Document G707.
  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 Final Acceptance 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 01 29 00

## SECTION 01 31 00 - 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. RFIs.
  4. Digital project management procedures.
  5. Project meetings.
- B Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

## 1.3 DEFINITIONS

- A BIM: Building Information Modeling.
- B RFI: Request for Information. Request from Owner, Architect, or 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, telephone number, and email address 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 cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  1. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory, and in prominent location inbuilt facility. Keep list current at all times.

## 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 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.
- C Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors 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. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.

## 1.6 COORDINATION DRAWINGS

- A Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated 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 coordination drawings 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 Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative 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 Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment; access locations and access sizes including size and direction of door swings; and connection points for ductwork, conduit, piping, etc.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
    - d. Locations of fan powered and/or VAV boxes and required access; show walls and ensure continuity of sound walls.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
    - e. Light fixture locations and elevations above finished floor for items not located in a suspended finished ceiling; mounting locations for light fixtures.
  8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
  10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
    - a. Same digital data software program, version, and operating system as original Drawings.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and PDF format.
  3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
    - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
- 1.7 REQUEST FOR INFORMATION (RFI)
- A General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  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 Architect.
  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 Architect.
1. Attachments shall be electronic files in PDF format.
- D Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect 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. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  3. Architect'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 Section 01 26 00 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the 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. Name and address of Architect.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

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

#### 1.8 PROJECT WEB SITE

- A Web-Based Project Software: Provide, administer, and use Owner approved web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project software site includes, at a minimum, the following features:
  - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
  - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
  - c. Document workflow planning, allowing customization of workflow between project entities.
  - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
  - e. Track status of each Project communication in real time, and log time and date when responses are provided.
  - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
  - g. Processing and tracking of payment applications.
  - h. Processing and tracking of contract modifications.
  - i. Creating and distributing meeting minutes.
  - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
  - k. Management of construction progress photographs.
  - l. Mobile device compatibility, including smartphones and tablets.

#### 1.9 PROJECT MEETINGS

- A General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
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 and Architect, within three days of the meeting.

- B Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers, representative from the State Construction Office; 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.
2. Agenda: Discuss items of significance that could affect progress, including the following:
  - a. Responsibilities and personnel assignments.
  - b. Tentative construction schedule.
  - c. Phasing.
  - d. Critical work sequencing and long lead items.

- e. Designation of key personnel and their duties.
  - f. Lines of communications.
  - g. Use of web-based Project software.
  - h. Procedures for processing field decisions and Change Orders.
  - i. Procedures for RFIs.
  - j. Procedures for testing and inspecting.
  - k. Procedures for processing Applications for Payment.
  - l. Distribution of the Contract Documents.
  - m. Submittal procedures.
  - n. Preparation of Record Documents.
  - o. Use of the premises.
  - p. Work restrictions.
  - q. Working hours.
  - r. Owner's occupancy requirements.
  - s. Responsibility for temporary facilities and controls.
  - t. Procedures for moisture and mold control.
  - u. Procedures for disruptions and shutdowns.
  - v. Construction waste management and recycling.
  - w. Parking availability.
  - x. Office, work, and storage areas.
  - y. Equipment deliveries and priorities.
  - z. First aid.
  - aa. Security.
  - bb. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.

- t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Final Acceptance.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Final Acceptance and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Final Acceptance and for final payment.
    - j. Submittal procedures.
    - k. Coordination of separate contracts.
    - l. Owner's partial occupancy requirements.
    - m. Installation of Owner's furniture, fixtures, and equipment.
    - n. Responsibility for removing temporary facilities and controls.
  - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E Progress Meetings: Conduct progress meetings at regular intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner, and Architect, 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to 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.
    - 1) Review schedule for next period.
  - b. Review present and future needs of each entity present, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Resolution of BIM component conflicts.
    - 4) Status of submittals.
    - 5) Deliveries.
    - 6) Off-site fabrication.
    - 7) Access.
    - 8) Site use.
    - 9) Temporary facilities and controls.
    - 10) Progress cleaning.
    - 11) Quality and work standards.
    - 12) Status of correction of deficient items.
    - 13) Field observations.
    - 14) Status of RFIs.
    - 15) Status of Proposal Requests.
    - 16) Pending changes.
    - 17) Status of Change Orders.
    - 18) Pending claims and disputes.
    - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, and Architect, 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) Resolution of BIM component conflicts.
  - 4) Status of submittals.
  - 5) Deliveries.
  - 6) Off-site fabrication.
  - 7) Access.
  - 8) Site use.
  - 9) Temporary facilities and controls.
  - 10) Work hours.
  - 11) Hazards and risks.
  - 12) Progress cleaning.
  - 13) Quality and work standards.
  - 14) Status of RFIs.
  - 15) Proposal Requests.
  - 16) Change Orders.
  - 17) Pending changes.
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 01 31 00

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## SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

## 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 documenting the progress of construction during performance of the Work, including the following:
  1. Startup construction schedule.
  2. Contractor's Construction Schedule.
  3. Construction schedule updating reports.
  4. Daily construction reports.
  5. Material location reports.
  6. Site condition reports.
  7. Unusual event reports.

## 1.3 DEFINITIONS

- A Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  2. Predecessor Activity: An activity that precedes another activity in the network.
  3. Successor Activity: An activity that follows another activity in the network.
- B Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E Event: The starting or ending point of an activity.
- F Float: The measure of leeway in starting and completing an activity.
  1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

## 1.4 INFORMATIONAL SUBMITTALS

- A Format for Submittals: Submit required submittals in the following format:
  1. PDF file.
  2. Two paper copies of sufficient size to display entire period or schedule, as required.
- B Startup construction schedule.
  1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

- C Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
  - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
  - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
  - 3. Total Float Report: List of activities sorted in ascending order of total float.
  - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F Construction Schedule Updating Reports: Submit with Applications for Payment.
- G Daily Construction Reports: Submit at weekly intervals.
- H Material Location Reports: Submit at monthly intervals.
- I Site Condition Reports: Submit at time of discovery of differing conditions.
- J Unusual Event Reports: Submit at time of unusual event.
- K Qualification Data: For scheduling consultant.

#### 1.5 QUALITY ASSURANCE

- A Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Review software limitations and content and format for reports.
  - 2. Verify availability of qualified personnel needed to develop and update schedule.
  - 3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
  - 4. Review delivery dates for Owner-furnished products.
  - 5. Review schedule for work of Owner's separate contracts.
  - 6. Review submittal requirements and procedures.
  - 7. Review time required for review of submittals and resubmittals.
  - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 9. Review time required for Project closeout and Owner startup procedures.
  - 10. Review and finalize list of construction activities to be included in schedule.
  - 11. Review procedures for updating schedule.

#### 1.6 COORDINATION

- A Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## 1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
1. Use Scheduling component of Project website software specified in Section 01 31 00 "Project Management and Coordination," for current Windows operating system.
- B Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
  2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- C Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- D Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
    - a. Elevators.
    - b. Other items to be determined.
  3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
  4. Commissioning Time: Include no fewer than 15 days for commissioning.
  5. Final Acceptance: Indicate completion in advance of date established for Final Acceptance, and allow time for Architect's administrative procedures necessary for certification of Final Acceptance.
  6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- E Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  6. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Final Acceptance.
    - e. Use-of-premises restrictions.
    - f. Provisions for future construction.

- g. Seasonal variations.
- h. Environmental control.
- 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
  - a. Subcontract awards.
  - b. Pre-construction tests and inspections.
  - c. Submittals.
  - d. Purchases.
  - e. Mockups.
  - f. Fabrication.
  - g. Sample testing.
  - h. Deliveries.
  - i. Installation.
  - j. Tests and inspections.
  - k. Adjusting.
  - l. Curing.
  - m. Startup and placement into final use and operation.
- 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
  - a. Structural completion.
  - b. Temporary enclosure and space conditioning.
  - c. Permanent space enclosure.
  - d. Completion of mechanical installation.
  - e. Completion of electrical installation.
  - f. Final Acceptance.
- F Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Final Acceptance, and final completion, and the following interim milestones:
  - 1. Temporary enclosure and space conditioning.
- G Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
  - 1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- H Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
  - 1. Unresolved issues.
  - 2. Unanswered Requests for Information.
  - 3. Rejected or unreturned submittals.
  - 4. Notations on returned submittals.
  - 5. Pending modifications affecting the Work and the Contract Time.
- I Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule seven days before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.

- J Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- K Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

#### 1.8 STARTUP CONSTRUCTION SCHEDULE

- A Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice of Award.
- B Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

#### 1.9 CPM SCHEDULE REQUIREMENTS

- A General: Prepare network diagrams using AON (activity-on-node) format.
- B Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
  - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
  - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing and inspection.

- j. Punch list and final completion.
- k. Activities occurring following final completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
  - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
  1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Main events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the schedule of values).
- G Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
  1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.
- H Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
  1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
  3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
  4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

#### 1.10 REPORTS

- A Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Testing and inspection.
  8. Accidents.
  9. Meetings and significant decisions.
  10. Unusual events.
  11. Stoppages, delays, shortages, and losses.
  12. Meter readings and similar recordings.
  13. Emergency procedures.
  14. Orders and requests of authorities having jurisdiction.
  15. Change Orders received and implemented.
  16. Construction Change Directives received and implemented.
  17. Services connected and disconnected.
  18. Equipment or system tests and startups.
  19. Partial completions and occupancies.
  20. Final Acceptances authorized.
- B Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 32 00

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## SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

## 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 the following:
  1. Final completion construction photographs.

## 1.3 INFORMATIONAL SUBMITTALS

- A Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B Digital Photographs: Submit image files within three days of taking photographs.
  1. Submit photos on CD-ROM or thumb-drive by or uploading to web-based project software site. Include copy of key plan indicating each photograph's location and direction.
  2. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.

## 1.4 QUALITY ASSURANCE

- A Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

## 1.5 FORMATS AND MEDIA

- A Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C Metadata: Record accurate date and time from camera.
- D File Names: Name media files with date and sequential numbering suffix.

## 1.6 CONSTRUCTION PHOTOGRAPHS

- A General: Take photographs with maximum depth of field and in focus.
  1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B Final Completion Construction Photographs: Take 20 or more photographs after date of Final Acceptance for submission as Project Record Documents. Architect will inform photographer of desired vantage points.
- C Additional Photographs: Architect may request photographs in addition to periodic photographs specified.
  1. Three days' notice will be given, where feasible.
  2. In emergency situations, take additional photographs within 24 hours of request.

3. Circumstances that could require additional photographs include, but are not limited to, the following:
  - a. Special events planned at Project site.
  - b. Immediate follow-up when on-site events result in construction damage or losses.
  - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
  - d. Final Acceptance of a major phase or component of the Work.
  - e. Extra record photographs at time of final acceptance.
  - f. Owner's request for special publicity photographs.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 32 33

## SECTION 01 33 00 - 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 This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

## 1.3 DEFINITIONS

- A Action Submittals: Written and graphic information and physical samples that require Architect'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 Architect'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."

## 1.4 SUBMITTAL SCHEDULE

- A Submittal Schedule: Submit, as an action submittal, a list 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 Architect 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 60 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 Architect's final release or approval.
    - g. Scheduled dates for purchasing.
    - h. Scheduled date of fabrication.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

## 1.5 SUBMITTAL FORMATS

- A Submittal Information: Include the following information in each submittal:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Architect.

4. Name of Contractor.
  5. Name of firm or entity that prepared submittal.
  6. Names of subcontractor, manufacturer, and supplier.
  7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
  8. Category and type of submittal.
  9. Submittal purpose and description.
  10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  11. Drawing number and detail references, as appropriate.
  12. Indication of full or partial submittal.
  13. Location(s) where product is to be installed, as appropriate.
  14. Other necessary identification.
  15. Remarks.
  16. Signature of transmitter.
- B Options: Identify options requiring selection by Architect.
- C Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by the Architect's software website, Newforma.

#### 1.6 SUBMITTAL PROCEDURES

- A Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Software: Prepare submittals in PDF form, and upload to Architect's Newforma website. Enter required data in web-based software site to fully identify submittal.
- 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. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
1. Final Submittals to be completed prior to 50 percent application of payment approval.
- D Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect'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 20 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect 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 20 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 20 days for initial review of each submittal.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 20 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
    - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- E Resubmittals: Make resubmittals in same form and quantities 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 Architect's action stamp.
- F 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.
- G Use for Construction: Use only final action submittals that are marked with approval notation from Architect action stamp.

## PART 2 PRODUCTS

### 2.1 ACTION SUBMITTALS

- A General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Prepare submittals as PDF files, or other format indicated by web-based Project management software website.
- 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 printed 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 written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Statement of compliance with specified referenced standards.
    - f. Manufacturer's catalog cuts.
    - g. Wiring diagrams showing factory-installed wiring.
    - h. Printed performance curves.
    - i. Operational range diagrams.
    - j. Mill reports.
    - k. Standard product operating and maintenance manuals.
    - l. Compliance with recognized trade association standards.
    - m. Compliance with recognized testing agency standards.
    - n. Testing of recognized testing agency.
    - o. Application of testing agency labels and seals.
    - p. Notation of coordination requirements.
    - q. Availability and delivery time information.
- 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.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.

- b. Identification of products.
  - c. Fabrication and installation drawings.
  - d. Roughing-in and setting diagrams.
  - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
  - f. Shop work manufacturing instructions.
  - g. Templates and patterns.
  - h. Schedules.
  - i. Design calculations.
  - j. Compliance with specified standards.
  - k. Notation of coordination requirements.
  - l. Notation of dimensions established by field measurement.
  - m. Relationship and attachment to adjoining construction clearly indicated.
  - n. Seal and signature of professional engineer if specified.
2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  3. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by web-based Project management software website.
  4. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
    - a. Coordination Drawings: Comply with requirements in Division 01 Section "Project Management and Coordination."
- D Samples: Submit physical units of materials or products, including the following:
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
  4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated and the following:
    - a. Size limitations.
    - b. Compliance with recognized standards.
    - c. Availability.
    - d. Delivery time.
  5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
    - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
    - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
  6. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
7. 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. Architect will return submittal with options selected.
8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the 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 three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
- E Product Schedule or List: 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.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- F Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- G Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."
- H Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures."
- I 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.

## 2.2 INFORMATIONAL SUBMITTALS

- A General: Prepare and submit Informational Submittals required by other Specification Sections.
  1. Prepare submittals as PDF files, or other format indicated by web-based Project management software website.
  2. Certificates and Certifications: Provide a notarized 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.
- B Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."
- C Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- F Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J Pre-construction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
- M Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. 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.
- N Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- O Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- P Design Data: Prepare 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.
- Q Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.
- R Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- S Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

### 2.3 DELEGATED DESIGN SERVICES

- A Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B Delegated Design Services Certification: As part of the submittal requirements for Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C BIM Incorporation: Incorporate delegated design drawing and data files into BIM established for Project.
1. Prepare delegated design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

## PART 3 EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A Action Submittals 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 Architect.
- B Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

### 3.2 ARCHITECT'S ACTION

- A General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
1. Reviewed.
  2. Furnish as Corrected.
  3. Rejected.

4. Revise and Resubmit.
- C Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
  - D Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
  - E Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
  - F Architect will discard submittals received from sources other than Contractor.
  - G Submittals not required by the Contract Documents will be returned by Architect without action.

END OF SECTION 01 33 00

## SECTION 01 40 00 - 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 inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, 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 Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five 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.
- B Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C 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, assembly, 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).
- D Mockups: Full-size physical assemblies that are constructed on-site in their actual final location as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- E 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.
- F Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

- H Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I 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.
- J 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

#### 1.4 DELEGATED-DESIGN SERVICES

- A Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional licensed in the State of North Carolina, for each product and system specifically assigned to Contractor to be designed or certified by a qualified design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.5 CONFLICTING REQUIREMENTS

- A Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements 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 direction 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.

#### 1.6 ACTION SUBMITTALS

- A Shop Drawings: For integrated exterior mockups.
  - 1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
  - 2. Indicate manufacturer and model number of individual components.
  - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.7 INFORMATIONAL SUBMITTALS

- A Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B Qualification Data: For Contractor's quality-control personnel.
- C Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
  2. Entity responsible for performing tests and inspections.
  3. Description of test and inspection.
  4. Identification of applicable standards.
  5. Identification of test and inspection methods.
  6. Number of tests and inspections required.
  7. Time schedule or time span for tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- F Reports: Prepare and submit certified written reports and documents as specified.
- G Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A Quality-Control Plan, General: Submit quality-control plan within 20 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.
- B Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  3. Owner-performed tests and inspections indicated in the Contract Documents.
- E Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.9 REPORTS AND DOCUMENTS

- A Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, telephone number, and email address of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

## 1.10 QUALITY ASSURANCE

- A General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D Installer Qualifications: A firm or individual experienced in installing, erecting, applying, 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.
- E Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
- a. Provide test specimens representative of proposed products and construction.
- b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
- d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
- e. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

#### 1.11 QUALITY CONTROL

- A Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
3. 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.

- B Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
  7. Provide Backflow Prevention Assembly Test Report to local authorities having jurisdiction and provides a copy Architect.
- C 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.
- D Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations 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 duties of Contractor.
- E Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- F Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G Associated Contractor Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.
- H Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
  1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.12 SPECIAL TESTS AND INSPECTIONS

- A Special Tests and Inspections: Conducted by a qualified testing agency and special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in the Statement of Special Inspections as indicated on Structural Drawings, and as follows:
  1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Final Acceptance, 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 Architect's reference during normal working hours.
  1. Submit log at Project closeout as part of Project Record Documents.

##### 3.2 REPAIR AND PROTECTION

- A General: On completion of testing, inspection, 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 01 73 00 "Execution."
- B Protect construction exposed by or for quality-control service activities.

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

END OF SECTION 01 40 00

## SECTION 01 42 00 - REFERENCES

## 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 DEFINITIONS

- A General: Basic Contract definitions are included in the Conditions of the Contract.
- B "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H "Provide": Furnish and install, complete and ready for the intended use.
- I "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

## 1.3 INDUSTRY STANDARDS

- A Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

## 1.4 ABBREVIATIONS AND ACRONYMS

- A Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities.
- C Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities.

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- D Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 42 00

## SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

## 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 temporary utilities, support facilities, and security and protection facilities.

## 1.3 REFERENCES

- A Acronyms and Abbreviations:
  - 1. ADA: Americans With Disabilities Act.
  - 2. AHJ: Authority (Authorities) Having Jurisdiction.
  - 3. USDOJ: United States Department of Justice.
  - 4. EPA: Environmental Protection Agency.
  - 5. HEPA: High Efficiency Particulate Air Filter.

## 1.4 USE CHARGES

- A Installation, removal and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and the AHJ.
- B Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E Data Service: Provide connectivity, both land line and wireless throughout the construction site.

## 1.5 INFORMATIONAL SUBMITTALS

- A Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel, pedestrian safety and accessibility, roadway closures for public rights of way, and site security measures including barriers/fencing location(s).
- B Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or AHJ, whichever is more stringent.
- E Fire-Safety Program: Show compliance with requirements of NFPA 241 and AHJ. Indicate Contractor personnel responsible for management of fire-prevention program.
- F Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
  3. Indicate methods to be used to avoid trapping water in finished work.
- G Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste-handling procedures.
  5. Other dust-control measures.
  6. Protections that may be required for adjacent buildings affected by the construction activities such as air intakes, exterior equipment, etc.
- H Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, occupied by Owner. For most activities, the Owner will require compliance with the Town of Chapel Hill Noise Ordinance. Include the following:
1. Methods used to meet the goals and requirements of Owner.
  2. Concrete cutting method(s) to be used.
  3. Location of construction devices on the site.
  4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
  5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with Owner.
  6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

## 1.6 QUALITY ASSURANCE

- A Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B Tests and Inspections: Arrange for AHJ to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C Accessible Temporary Egress: Comply with applicable provisions in the USDOJ publication 2010 ADA Standards for Accessible Design and ICC A117.1 – 2009.

## 1.7 PROJECT CONDITIONS

- A Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A Chain-Link Fencing: At least 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; at least 6 feet high with galvanized-steel pipe posts; at least 2-3/8-inch outside diameter line posts and 2-7/8-inch outside diameter corner and pull posts, with 1-5/8-inch outside diameter top rails.
- B Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C Polyethylene Sheet: Reinforced, fire-resistive sheet, at least 10-mil thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

- D Dust-Control Adhesive-Surface Walk-Off Mats: Provide at least 36 by 60 inch mats.
- E Insulation: Unfaced mineral-fiber blanket, manufactured from rock wool; with flame-spread and smoke-developed indexes of no more than 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

- A Field Offices: Coordinate with Owner for space availability for the following:
  - 1. Contractor provided prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 20 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
  - 6. Provide internet connectivity for use by Architect and Owner.
  - 7. Provide projection technology for at least 90-inch screen size.
  - 8. Provide two workstations for use of Owner and Architect.
- C Storage and Fabrication Sheds: Storage and fabrication sheds are not permitted on site. Any required lay down space will be in the building under construction, covered appropriately on site, or at the Owner's off-site storage facility.
  - 1. For items stored in the building, the floor plate must be equally loaded.
  - 2. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to AHJ, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 Closeout Procedures.
- C Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A Conservation: Coordinate construction and use of temporary facilities 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 Specification Sections for disposition of salvaged materials that are designated as Owner's property.

### 3.2 INSTALLATION, GENERAL

- A Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied area, as well as existing buildings adjacent to the Project as follows:
  1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas. Protect air intakes, piping, etc. on buildings adjacent to where the work is to be performed.
    - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
  2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
  3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

### 3.3 TEMPORARY UTILITY INSTALLATION

- A General: Install temporary service.
  1. Give written advance notice to the Owner when temporary utilities will be installed.
  2. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  1. Connect temporary sewers to municipal system as directed by AHJ.
- C Water Service:
  1. Install water service and distribution piping in sizes and pressures adequate for construction.
- D Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of AHJ for type, number, location, operation, and maintenance of fixtures and facilities.
  1. Use of Permanent Toilets: Use of Owner's existing to remain, or new toilet facilities is not permitted.
  2. Use of Permanent Toilets: Use of Owner's existing toilet facilities to be demolished will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner and their use does not interrupt the Work.
- E Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F Electric Power Service:
  1. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
    - a. Install electric power service underground unless otherwise indicated.

- b. Connect temporary service to Owner's existing power source, as directed by Owner.
- G Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line for each field office.
  - 1. Provide additional telephone lines for the following:
  - 2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
- I Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.
- J Project Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
  - 1. Processor: Intel Core i5 or i7.
  - 2. Memory: 16 gigabytes.
  - 3. Disk Storage: 1 -terabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  - 4. Display: 24-inch monitor with 256-Mb dedicated video RAM.
  - 5. Full-size keyboard and mouse.
  - 6. Network Connectivity: 10/100BaseT Ethernet.
  - 7. Operating System: Microsoft Windows 10 Professional.
  - 8. Productivity Software:
    - a. Microsoft Office Professional, 2013 or higher, including Word, Excel, and Outlook.
    - b. Adobe Reader DC, or approved equal.
    - c. WinZip 10.0 or higher, or approved equal.
  - 9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
  - 10. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall, providing minimum 10.0 -Mbps upload and 50 -Mbps download speeds at each computer.
  - 11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
  - 12. Backup: External hard drive, at least 2 terabytes, with automated backup software providing daily backups.

### 3.4 SUPPORT FACILITIES INSTALLATION

- A General: Comply with the following:
  - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
    - a. Where approved by Owner, utilize designated area within existing building for temporary field offices.
  - 2. Maintain support facilities until Architect schedules Final Acceptance inspection. Remove before Final Acceptance. Personnel remaining after Final Acceptance will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C Traffic Controls: Comply with requirements of AHJ.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D Parking: Provide temporary offsite parking areas for construction personnel.
- E Storage and Staging: Provide temporary offsite area if designated areas of Project site for storage and staging needs are not sufficient.
- F Dewatering Facilities and Drains: Comply with requirements of AHJ. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- G Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
    - b. Provide sign indicating that Fire Arms are Prohibited on State Construction Job Site.
  - 3. Maintain and touch up signs so they are legible at all times.
- H Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 Construction Waste Management and Disposal.
- I Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Final Acceptance, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
  - 1. Do not load elevators beyond their rated weight capacity.
  - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- K Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Final Acceptance, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

### 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
  - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

- B Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or AHJ, whichever is more stringent, and requirements specified in Section 31 10 00 Site Clearing.
- D Stormwater Control: Comply with requirements of AHJ. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Final Acceptance. Perform control operations lawfully, using materials approved by AHJ.
- G Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I Barricades, Warning Signs, and Lights: Comply with requirements of AHJ for erecting structurally adequate barricades, including warning signs and lighting.
- J Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by AHJ.
- K Covered Walkway: Erect protective covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of AHJ.
  - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - 2. Paint and maintain appearance of walkway for duration of the Work.
- L Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- M Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
  - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
    - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
  - 3. Where fire-resistance-rated temporary partitions are indicated or are required by AHJ, construct partitions according to the rated assemblies.
  - 4. Insulate partitions to control noise transmission to occupied areas.

5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
  6. Protect air-handling equipment.
  7. Provide walk-off mats at each entrance through temporary partition.
- N Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of AHJ.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.6 MOISTURE AND MOLD CONTROL

- A Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard and replace stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.7 OPERATION, TERMINATION, AND REMOVAL

- A Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Acceptance.
- D Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Final Acceptance. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by AHJ.
  3. At Final Acceptance, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 Closeout Procedures.

END OF SECTION 01 50 00

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## SECTION 01 60 00 - PRODUCT REQUIREMENTS

## PART 1 GENERAL

## 1.1 SUMMARY

- A Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

## 1.2 DEFINITIONS

- A Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of the basis-of-design product establish salient characteristics of products for purposes of evaluating comparable products.
- C Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; Submit a substitution request, if applicable.
- D Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
  - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  - 2. Data indicating compliance with the requirements specified in "Comparable Products" Article.
- E Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."
- F Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

## 1.3 QUALITY ASSURANCE

- A Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
  - a. Name of product and manufacturer.
  - b. Model and serial number.
  - c. Capacity.
  - d. Speed.
  - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

#### 1.4 COORDINATION

- A Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.
  7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

#### 1.6 PRODUCT WARRANTIES

- A Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

## PART 2 PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  - 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  - 7. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in Section 01 25 00 "Substitution Procedures " to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.
- B Product Selection Procedures:
  - 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
  - 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
  - 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
  - 4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
  - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
  1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.
- B Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 01 33 00 "Submittal Procedures."
  2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

## PART 3 EXECUTION (NOT USED)

END OF SECTION 01 60 00

## SECTION 01 73 00 - 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 subsequent work.
- B Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

## 1.4 PREINSTALLATION MEETINGS

- A Cutting and Patching Conference: Conduct conference at Project site.
  1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
    - a. Contractor's superintendent.
    - b. Trade supervisor responsible for cutting operations.
    - c. Trade supervisor(s) responsible for patching of each type of substrate.
    - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
  2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.5 INFORMATIONAL SUBMITTALS

- A Qualification Data: For professional engineer.
- B Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C 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.
- D Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E Certified Surveys: Submit two copies signed by land surveyor and/or professional engineer.
- F Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

#### 1.6 QUALITY ASSURANCE

- A Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B 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 Architect of locations and details of cutting and await directions from Architect 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.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Plumbing piping systems.
    - f. Mechanical systems piping and ducts.
    - g. Control systems.
    - h. Communication systems.
    - i. Fire-detection and -alarm systems.
    - j. Conveying systems.
    - k. Electrical wiring systems.
    - l. Operating systems of special construction.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.
    - d. Sprayed fire-resistive material.
    - e. Equipment supports.
    - f. Piping, ductwork, vessels, and equipment.
    - g. Noise- and vibration-control elements and systems.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

## 1.7 WARRANTY

- A Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A General: Comply with requirements specified in other Sections.
  - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- 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 Architect 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 sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- 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 roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. 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 local utility and 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 Architect according to requirements in Section 01 31 00 "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 Architect promptly.
- B General: Engage a professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D 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.
- E 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 Architect.

### 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 Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

- C Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Final Acceptance, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 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.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- 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 Final Acceptance.
- 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: Where possible, select tools or equipment that minimize production of excessive 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 portions of the 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 Architect.
  - 2. Allow for building 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 Repair or remove and replace damaged, defective, or nonconforming Work.
  1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

### 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 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C Temporary Support: Provide temporary support of work to be cut.
- D 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.
- E Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."
- F 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 prevent interruption to occupied areas.
- G 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. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. 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.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H 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 piping, conduit, and similar features before applying paint or other finishing materials.
- b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I 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 Final Acceptance.
- G Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- 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 Final Acceptance.
- 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 ensure 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 STARTING AND ADJUSTING

- A Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Final Acceptance.
- B Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

## SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## 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 This Section includes administrative and procedural requirements for the following:
  1. Salvaging nonhazardous demolition and construction waste.
  2. Recycling nonhazardous demolition and construction waste.
  3. Disposing of nonhazardous demolition and construction waste.

## 1.3 DEFINITIONS

- A Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.4 MATERIALS OWNERSHIP

- A Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

## 1.5 ACTION SUBMITTALS

- A Waste Management Plan and Progress Reports: Submit initial Waste Management Plan within 7 days of date established for the Notice to Proceed, and monthly progress reports. Submit monthly progress reports concurrent with each Application of Payment.

## 1.6 INFORMATIONAL SUBMITTALS

- A Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- B Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- C Qualification Data: For waste management coordinator and refrigerant recovery technician.
- D Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

- E Refrigerant Recovery: Comply with requirements in Section 02 41 19 Selective Demolition for refrigerant recovery submittals.

#### 1.7 QUALITY ASSURANCE

- A Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may not serve as Waste Management Coordinator.
- B Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
  1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
  2. Review requirements for documenting quantities of each type of waste and its disposition.
  3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  5. Review waste management requirements for each trade.

#### 1.8 WASTE MANAGEMENT PLAN

- A General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

### PART 2 PRODUCTS

#### 2.1 WASTE VENDORS

- A Subject to compliance with requirements, approved waste vendors include the following:
  1. Clean Harbors.
  2. Ecoflo.
  3. EEI.
  4. Heritage.
  5. PSC.

6. Tradebe/PCI.
7. Lee Iron and Metal Co., Inc.
8. NSB.
9. Veolia.

## 2.2 PERFORMANCE GOALS

- A General: Achieve end-of-Project rates for salvage/recycling of as much as possible of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

## PART 3 EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A General: Implement waste management plan as approved by Architect and University of North Carolina at Chapel Hill's Office of Waste Reduction and Recycling (OWRR). Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

### 3.2 SALVAGING DEMOLITION WASTE

- A Comply with requirements in Section 02 41 19 Selective Demolition for salvaging demolition waste.
- B Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  3. Store items in a secure area until installation.
  4. Protect items from damage during transport and storage.
  5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C Salvaged Items for Sale and Donation: Not permitted on Project site.
- D Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.

- 5. Protect items from damage during transport and storage.
- E Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- G Plumbing Fixtures: Separate by type and size.
- H Lighting Fixtures: Separate lamps by type and protect from breakage.
- I Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A General: Recycle paper and beverage containers used by on-site workers.
- B Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.4 RECYCLING DEMOLITION WASTE

- A Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum 4-inch size.
  - 2. Crush concrete and screen to comply with requirements in Section 31 20 00 "Earth Moving" for use as satisfactory soil for fill or subbase.
- C Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 1-1/2-inch size.
    - a. Crush masonry and screen to comply with requirements in Section 31 20 00 "Earth Moving" for use as satisfactory soil for fill or subbase.
    - b. Crush masonry and screen to comply with requirements in Section 32 93 00 "Plants" for use as mineral mulch.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- D Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

- G Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- I Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- J Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- K Carpet Tile: Remove debris, trash, and adhesive.
  - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- M Conduit: Reduce conduit to straight lengths and store by material and size.
- N Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
- C Paint: Seal containers and store by type.

### 3.6 DISPOSAL OF WASTE

- A General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B Burning: Do not burn waste materials.
- C Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

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## SECTION 01 77 00 - 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. Final Acceptance procedures.
  2. Final completion procedures.
  3. Warranties.
  4. Final cleaning.

## 1.3 DEFINITIONS

- A List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

## 1.4 ACTION SUBMITTALS

- A Product Data: For each type of cleaning agent.
- B Contractor's List of Incomplete Items: Initial submittal at Final Acceptance.
- C Certified List of Incomplete Items: Final submittal at Final Completion.

## 1.5 CLOSEOUT SUBMITTALS

- A Certificates of Release: From authorities having jurisdiction.
- B Certificate of Insurance: For continuing coverage.
- C Field Report: For pest-control inspection.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

## 1.7 FINAL ACCEPTANCE 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 Final Acceptance: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Final Acceptance. 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, 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 Architect. Label with manufacturer's name and model number.

- 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 Architect's signature for receipt of submittals.
5. Submit testing, adjusting, and balancing records.
- C Procedures Prior to Final Acceptance: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Final Acceptance. 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. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Final Acceptance.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D Inspection: Submit a written request for inspection to determine Final 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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Final Acceptance after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. 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.
- 1.8 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 in accordance with Section 01 29 00 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Final Acceptance inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. 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.
  5. Submit Contractor's General Warranty form.
  6. Submit Asbestos-Free Warranty form.
  7. Submit Final Completion photographic documentation.
- 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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C State Construction Office (SCO) Final Inspection: Submit a written request for SCO 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. Architect will coordinate with the State Construction Office, Contractor and Owner for date SCO final inspection will occur. Architect will proceed with inspection with SCO Representative, Owner and Contractor present. Architect 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.9 LIST OF INCOMPLETE ITEMS

- 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.
  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, 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 Architect.
    - d. Name of Contractor.
    - e. Page number.

#### 1.10 SUBMITTAL OF PROJECT WARRANTIES

- A Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Final Acceptance, 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.
- D Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  1. Submit on digital media acceptable to Architect.

### 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 commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Final Acceptance for entire Project or for a designated portion of Project:
    - a. Clean Project site 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 not planted, mulched, or 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, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
    - i. Vacuum and mop concrete.
    - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - l. Remove labels that are not permanent.
    - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    - r. Clean strainers.
    - s. Leave Project clean and ready for occupancy.
- C Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

END OF SECTION 01 77 00

## SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

## PART 1 GENERAL

## 1.1 SUMMARY

- A Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  1. Operation and maintenance documentation directory manuals.
  2. Emergency manuals.
  3. Systems and equipment operation manuals.
  4. Systems and equipment maintenance manuals.
  5. Product maintenance manuals.

## 1.2 DEFINITIONS

- A System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B Subsystem: A portion of a system with characteristics similar to a system.

## 1.3 CLOSEOUT SUBMITTALS

- A Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B Format: Submit operation and maintenance manuals in the following format:
  1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
- C Initial Manual Submittal: Submit draft copy of each manual at least 15 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Final Acceptance and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## 1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

### 1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Architect.
  - 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 8. Cross-reference to related systems in other operation and maintenance manuals.
- C Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single file.
- E Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

### 1.7 EMERGENCY MANUALS

- A Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- C Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.

2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- D Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.
- 1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS
- A Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- C Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- D Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.

4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- E Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

#### 1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- E Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording.
- F Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  1. Include procedures to follow and required notifications for warranty claims.
- J Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  1. Do not use original project record documents as part of maintenance manuals.

#### 1.10 PRODUCT MAINTENANCE MANUALS

- A Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D Product Information: Include the following, as applicable:
  1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- E Maintenance Procedures: Include manufacturer's written recommendations and the following:
  1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- F Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  1. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 78 23

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## SECTION 01 78 39 - 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.

## 1.3 CLOSEOUT SUBMITTALS

- A Record Drawings: Comply with the following:
  1. Submit record digital data files and three set(s) of record digital data file plots.
  2. Plot each drawing file, whether or not changes and additional information were recorded.
- B Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

## 1.4 RECORD DRAWINGS

- A Record Digital Data Files: Immediately before inspection for Certificate of Final Acceptance, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
  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 Architect for resolution.

## 1.5 RECORD SPECIFICATIONS

- A Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B Format: Submit record Specifications as annotated PDF electronic file.

## 1.6 RECORD PRODUCT DATA

- 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 Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- C Format: Submit record Product Data as annotated PDF electronic file.
  - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MAINTENANCE OF RECORD DOCUMENTS

- A Maintenance of Record Documents: Store record documents 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 Architect's reference during normal working hours.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 78 39

## SECTION 01 79 00 - DEMONSTRATION AND TRAINING

## 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 instructing Owner's personnel, including the following:
  1. Demonstration of operation of systems, subsystems, and equipment.
  2. Training in operation and maintenance of systems, subsystems, and equipment.

## 1.3 INFORMATIONAL SUBMITTALS

- A Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B Attendance Record: For each training module, submit list of participants and length of instruction time.
- C Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

## 1.4 CLOSEOUT SUBMITTALS

- A Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date of video recording.
  2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
  3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

## 1.5 QUALITY ASSURANCE

- A Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.

2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.6 COORDINATION

- A Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.

- e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
    - a. Alignments.
    - b. Checking adjustments.
    - c. Noise and vibration adjustments.
    - d. Economy and efficiency adjustments.
  6. Troubleshooting: Include the following:
    - a. Diagnostic instructions.
    - b. Test and inspection procedures.
  7. Maintenance: Include the following:
    - a. Inspection procedures.
    - b. Types of cleaning agents to be used and methods of cleaning.
    - c. List of cleaning agents and methods of cleaning detrimental to product.
    - d. Procedures for routine cleaning
    - e. Procedures for preventive maintenance.
    - f. Procedures for routine maintenance.
    - g. Instruction on use of special tools.
  8. Repairs: Include the following:
    - a. Diagnosis instructions.
    - b. Repair instructions.
    - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    - d. Instructions for identifying parts and components.
    - e. Review of spare parts needed for operation and maintenance.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

### 3.2 INSTRUCTION

- A Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

- F Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
1. Submit video recordings on CD-ROM or thumb drive.
  2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
  3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
  4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. Email address.
- C Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.
- E Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- F Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

## SECTION 04 20 00 - UNIT MASONRY

## PART 1 GENERAL

## 1.1 SUMMARY

- A Section Includes:
  - 1. Clay face brick.
  - 2. Concrete masonry units.
  - 3. Mortar and grout.
  - 4. Steel reinforcing bars.
  - 5. Masonry-joint reinforcement.
  - 6. Ties and anchors.
  - 7. Embedded flashing.
  - 8. Miscellaneous masonry accessories.
- B Products Installed but not Furnished under this Specification Section:
  - 1. Steel shelf angles for supporting unit masonry.
  - 2. Cavity wall insulation.

## 1.2 REFERENCES

- A Acronyms and Abbreviations:
  - 1. BIA: Brick Industry Association.
  - 2. SMACNA: Sheet Metal and Air Conditioning Contractors Association.
  - 3. TMS: The Masonry Society.
- B Definitions:
  - 1. Reinforced Masonry: Means masonry containing reinforcing steel in grouted cells.

## 1.3 SUBMITTALS

- A Action Submittals:
  - 1. Product Data: For each type of product; include Health Product Declaration and Environmental Product Declaration.
  - 2. Shop Drawings: For the following:
    - a. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
    - b. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
    - c. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
  - 3. Samples: For each type and color of the following:
    - a. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
    - b. Pigmented mortar. Make Samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
    - c. Weep/cavity vents.
    - d. Cavity drainage material.
    - e. Accessories embedded in the masonry.
- B Informational Submittals:
  - 1. Material Certificates: For each type of the following:
    - a. Masonry units.
      - 1) Include material test reports substantiating compliance with requirements.
      - 2) For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
    - b. Cementitious materials. Include name of manufacturer, brand name, and type.
    - c. Mortar admixtures.
    - d. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

- e. Grout mixes. Include description of type and proportions of ingredients.
  - f. Reinforcing bars.
  - g. Joint reinforcement.
  - h. Anchors, ties, and metal accessories.
2. Qualification Data: For testing agency and masonry installer.
  3. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  4. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

#### 1.4 QUALITY ASSURANCE

- A Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B Preconstruction Testing Service: General Contractor will engage a third party qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by General Contractor. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
  1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.6 FIELD CONDITIONS

- A Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover at least 24 inches down both sides and hold cover securely in place.
- B Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602. Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from the same manufacturer for each product required.
- B Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

### 2.2 PERFORMANCE REQUIREMENTS

- A General: Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 inch ACI 530.1/ASCE 6/TMS 602.
1. For Concrete Unit Masonry: f'm = 2000 psi.
- B Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed work and will be within 20 ft. vertically and horizontally of a walking surface.

### 2.3 CONCRETE MASONRY UNITS

- A General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners.
- B Concrete Masonry Units: Current Edition of ASTM C 90 and as follows:
1. Concrete masonry units shall not contain cinders bottom ash and shall be free of organic impurities that will cause rusting, staining, or pop-outs.
  2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
  3. Weight Classification: Lightweight.
  4. Walls requiring vertical reinforcing shall use open end masonry units manufactured by the CMU supplier.

### 2.4 BRICK

- A General: Provide shapes indicated and as follows.
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

- B Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing, as indicated on the Drawings.
  - 1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  - 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C Face Brick: Facing brick complying with ASTM C 216.
  - 1. Basis-of-Design Product: Subject to compliance with the Contract Documents design is based on the following.
    - a. "Red Royal" as manufactured by Statesville Brick Company.
  - 2. Acceptable Manufacturers: Subject to compliance with the Contract Documents provide the basis-of-design product or comparable approved product by one of the following.
    - a. Palmetto Brick Company.
    - b. Pine Hall Brick Company; "Old Colony" brick.
  - 3. Grade: SW, unless otherwise indicated.
  - 4. Type: FBS, unless otherwise indicated.
  - 5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
  - 6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  - 7. Size (Actual Dimensions): As indicated on the Drawings.

## 2.5 MORTAR AND GROUT MATERIALS

- A Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
  - 1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C 114.
- B Hydrated Lime: ASTM C 207, Type S.
- C Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D Mortar Cement: Complying with ASTM C 1329.
- E Masonry Cement: Masonry cement is prohibited.
- F Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 1. White-Mortar Aggregates: Natural white sand or ground white stone.
  - 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
  - 3. Masonry cement is not allowed.
- G Aggregate for Grout: ASTM C 404.
- H Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- I Water: Potable.

## 2.6 REINFORCING STEEL

- A Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

## 2.7 MASONRY JOINT REINFORCEMENT

- A General: ASTM A 951 and as follows:
  - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
  - 2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
  - 3. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
  - 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

- B For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches on center.

## 2.8 TIES AND ANCHORS, GENERAL

- A General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- D Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

## 2.9 ADJUSTABLE MASONRY-VENEER ANCHORS

- A General: Provide thermally broken, 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
  - 1. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
- B Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange by not less than three exposed threads.
  - 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
    - b. Basis of Design Product: Subject to compliance with the Contract Documents, provide "Pos-I-Tie" as manufactured by Heckmann Building Products Inc.; or comparable by one of the following:
      - 1) Dayton Superior Corporation.
      - 2) Hohmann & Barnard, Inc.
      - 3) Wire-Bond.
    - c. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.
    - d. Wire Ties: Seismic triangular-shaped wire ties fabricated from 0.187-inch- diameter, hot-dip galvanized steel wire in length as indicated on Drawings.

## 2.10 MISCELLANEOUS ANCHORS

- A Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch, galvanized steel sheet.
- C Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
  - 1. Headed bolts.
  - 2. Nonheaded bolts, bent in manner indicated.
- D Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Type: Expansion anchors.
  - 2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to 4 times the loads imposed.
4. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to 6 times the loads imposed.

## 2.11 EMBEDDED FLASHING

- A General: Provide metal flashing complying with the SMACNA publication Architectural Sheet Metal Manual that apply to design, dimensions, metal, and other characteristics of the item and as follows:
1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, at least 0.016 inch thick.
  2. Fabricate continuous flashings in sections at least 96 inches long, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
  3. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
  4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing ½ inch out from wall, with outer edge bent down 30 degrees and hemmed.
  5. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
  6. Fabricate metal drip edges from sheet metal indicated above.
- B Flexible Flashing: Use the following unless otherwise indicated:
1. Laminated Stainless Steel Flashing: Manufacturer's standard Stainless steel core with polymer fabric laminated to the bottom stainless steel face with non-asphalt adhesive. The top face (exposed side) must not be covered with a polymer fabric. Use only where flashing is fully concealed in masonry.
  2. Laminated Stainless Steel Flashing Products:
    - a. York Manufacturing, Inc.; Multi-Flash SS
    - b. Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
    - c. Prosoco, Inc.; R-Guard SS ThruWall
    - d. STS Coatings, Inc.; Wall Guardian Stainless Steel TWF
    - e. TK Products, Inc.; TK TWF
- C Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.12 MISCELLANEOUS MASONRY ACCESSORIES

- A Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D Cell Vents: Composite cellular vents consisting of small passageways bonded together; 3/8 inch wide by 2-1/2 inch deep by 3-3/8 inch long; color as selected by Architect from manufacturer's full range.
- E Plastic Weep Hole/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill head joint with outside face held back 1/8 inch from exterior face of masonry, in color selected from manufacturer's standard.
1. Plastic weep vent is to sit directly on through-wall flashing.
- F Cavity Drainage Material: 2-inch- thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

- G Drainage Mat: Randomly oriented geometric patterned drainage and ventilation mat designed to eliminate moisture and moisture vapor.
- H Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.187-inch steel wire, hot-dip galvanized after fabrication.
  - 1. Provide units with either 2 loops or 4 loops as needed for number of bars indicated.
- I Control and Expansion Joint Sealants: Provide sealants, expansion joints and preformed joint sealants as specified in Section 07 92 00 Joint Sealants.

## 2.13 MORTAR AND GROUT MIXES

- A General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Add cold-weather admixture, if used, at the same rate for mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
  - 1. Limit cementitious materials in mortar for exterior masonry to portland cement, mortar cement, and lime.
  - 2. For masonry below grade, in contact with earth, and where indicated, use Type M.
  - 3. For reinforced masonry and where indicated, use Type S.
  - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
  - 1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
  - 2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
- E Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
  - 1. Mix to match Architect's approved submitted Sample.
- F Grout for Unit Masonry: Comply with ASTM C 476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

## 2.14 SOURCE QUALITY CONTROL

- A Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Examine conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Verify that foundations are within tolerances specified.
  - 2. Verify that reinforcing dowels are properly placed.
- B Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 1. Installation of unit masonry indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A Before installation, examine rough-in and built-in construction to verify locations of piping connections.

### 3.3 INSTALLATION, GENERAL

- A Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B Build chases and recesses to accommodate items specified in this Specification Section and in other Sections of the Specifications.
- C Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- F Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

### 3.4 CONSTRUCTION TOLERANCES

- A Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
  - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
  - 3. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
  - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
  - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

### 3.5 LAYING MASONRY WALLS

- A Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. As indicated on the Drawings.
- C Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

- D Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- G Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
- I All interior masonry walls shall be braced to roof or floor structure above, as indicated.

### 3.6 MORTAR BEDDING AND JOINTING

- A Lay hollow masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
  - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
  - 1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- D Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

### 3.7 CAVITIES

- A Keep cavities clean of mortar droppings and other materials during construction.

### 3.8 MASONRY JOINT REINFORCEMENT

- A General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches on center.
  - 2. Space reinforcement not more than 8 inches on center in foundation walls, unless otherwise indicated on Drawings.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 24 inches beyond openings, unless otherwise indicated on Drawings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.9 ANCHORING MASONRY VENEERS

- A Anchor masonry veneers to wall framing or concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to wall framing with two metal fasteners of type indicated.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches on center vertically and 16 inches on center horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

### 3.10 CONTROL AND EXPANSION JOINTS

- A General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
1. If vertical control joints are not indicated on the Drawings, provide and install 3/8" control joints in brick and CMU at no more than 24 feet on center and coordinate locations with the Architect.
- B Form control joints in concrete masonry as follows:
1. Generally, install preformed control-joint gaskets designed to fit standard sash block.
  2. Where indicated, install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
- C Form expansion joints in brick as follows:
1. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 Joint Sealants. Keep joint free and clear of mortar.
- D Build in horizontal, pressure-relieving joints where indicated; construct joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 Joint Sealants.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### 3.11 FLASHING, WEEP HOLES, AND VENTS

- A General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C Install flashing as follows:
1. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier or building paper.
  2. At lintels and shelf angles, extend flashing at least 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
- D Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Use plastic weep hole/vents to form weep holes.
  2. Place cavity drainage material immediately above flashing in cavities at bottom of cavity and as indicated on drawings.

### 3.12 REINFORCED UNIT MASONRY INSTALLATION

- A Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements of ACI 530.1/ASCE 6/TMS for cleanouts and for grout placement, including minimum grout space and maximum pour height.

### 3.13 FIELD QUALITY CONTROL

- A Owner may engage a qualified independent testing agency to perform field quality-control testing indicated below.
1. Payment for these services will be made by Owner.
  2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B Mortar properties will be tested per ASTM C 780.
- C Grout will be sampled and tested for compressive strength per ASTM C 1019.
- D Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
- E Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

### 3.14 REPAIRING, POINTING, AND CLEANING

- A Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Protect adjacent surfaces from contact with cleaner.
  2. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  3. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."

### 3.15 MASONRY WASTE DISPOSAL

- A Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

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## SECTION 04 72 00 - CAST STONE MASONRY

## 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 Specification Section.

## 1.2 SUMMARY

- A Section Includes:
  - 1. Wall panels.
  - 2. Trim units.
  - 3. Supplementary components and accessories normally furnished or otherwise necessary for a complete installation.

## 1.3 REFERENCES

- A Acronyms and Abbreviations
  - 1. APA: Architectural Precast Association.
  - 2. CSI: Cast Stone Institute.
  - 3. TMS: The Masonry Society.
- B Definitions:
  - 1. Manufacturer: Means the cast stone manufacturer unless otherwise indicated.

## 1.4 SUBMITTALS

- A Action Submittals:
  - 1. Product Data: For each type of product; include Health Product Declaration and Environmental Product Declaration.
  - 2. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
  - 3. Samples:
    - a. Verification Samples:
      - 1) For each color and texture of cast stone required, 10 inches square in size.
      - 2) For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
    - b. Full-Size Samples: After approval of verification sample, for each color, texture, and shape of cast-stone unit required.
      - 1) Make available for Architect's review at Project site.
      - 2) Make Samples from materials to be used for units used on Project.
      - 3) Approved, undamaged Samples may be installed in the work.
- B Informational Submittals:
  - 1. Qualification Data: For manufacturer.
  - 2. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364.
    - a. Provide test reports based on testing within previous 2 years.

## 1.5 QUALITY ASSURANCE

- A Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI or APA.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A Coordinate delivery of cast stone with masonry work to avoid delaying the work and to minimize the need for on-site storage.
- B Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units if required, using dollies with wood supports.
  2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

#### 1.7 FIELD CONDITIONS

- A Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees Fahrenheit and above and will remain so until cast stone has dried, but not less than 7 days after completing cleaning.
- B Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A Source Limitations for Cast Stone: Obtain cast-stone units from single source from the same manufacturer.
- B Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

#### 2.2 CAST-STONE MATERIALS

- A General: Comply with ASTM C 1364.
- B Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C Aggregates: ASTM C 33; in gradation as needed to produce required colors and textures.
1. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
  2. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- D Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- E Admixtures:
1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
  2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
- F Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast-stone material.
1. Epoxy Coating: ASTM A 775/A 775M.
  2. Galvanized Coating: ASTM A 767/A 767M.

- G Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276/A 276M, or ASTM A 666, Type 304.

### 2.3 CAST-STONE UNITS

- A Manufacturers: Subject to compliance with the Contract Documents, provide products by one of the following.
1. Cast Stone Systems, Inc.
  2. Lucas Concrete Products.
  3. P&D Architectural Precast Inc.
- B Cast-Stone Units: Comply with ASTM C 1364.
1. Units are manufactured using the manufacturer's selected method.
  2. Wall Panels: Sizes as indicated on the Drawings.
  3. Trim Units: As indicated on the Drawings.
- C Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
- D Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
  2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
  3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
  4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.
- E Cure Units as Follows:
1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
  2. Keep units damp and continue curing with one of the following:
    - a. No fewer than 5 days at mean daily temperature of 70 deg F or above.
    - b. No fewer than 7 days at mean daily temperature of 50 deg F or above.
- F Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G Colors and Textures: Match Architect's approved verification Samples.

### 2.4 MORTAR MATERIALS

- A Provide mortar materials that comply with Section 04 20 00 Unit Masonry.

### 2.5 ACCESSORIES

- A Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.
- B Dowels: 1/2-inch diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.
- C Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
- D Accessories: As supplied, recommended, or required by the manufacturer and as necessary for a complete installation.

### 2.6 SOURCE QUALITY CONTROL

- A Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.

## PART 3 EXECUTION

## 3.1 EXAMINATION

- A Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 1. Installation of cast stone masonry indicates acceptance of surfaces and conditions.

## 3.2 SETTING CAST STONE IN MORTAR

- A Set cast stone as indicated in the TMS publication *TMS 604 Standard Specification for Installation of Architectural Cast Stone*.

## 3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A Set cast stone as indicated in the TMS publication *TMS 604 Standard Specification for Installation of Architectural Cast Stone*.

## 3.4 INSTALLATION TOLERANCES

- A Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or more than 1/2 inch.
- B Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or more than 1/2 inch.
- C Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

## 3.5 ADJUSTING AND CLEANING

- A Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C In-Progress Cleaning: Clean cast stone as work progresses.
  - 1. Remove mortar fins and smears before tooling joints.
  - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
  - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  - 5. Clean cast stone by methods described in the CSI publication *Technical Bulletin #39* and in accordance with the cleaner manufacturer's written instructions.

END OF SECTION 04 72 00

## SECTION 05 40 00 - COLD-FORMED METAL FRAMING

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A Formed steel stud exterior wall and interior wall framing.

## 1.2 DEFINITIONS

- A General: See AISI S240 for definitions of terms used in this section.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.
- B Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.

## 1.4 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.
- C Product Data: Provide manufacturer's data on factory-made connectors and mechanical fasteners, showing compliance with requirements.
- D Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
  - 1. Indicate stud and ceiling joist layout.
  - 2. Describe method for securing studs to tracks and for bolted framing connections.
- E Evaluation Service Reports: Provide reports indicating compliance with specified requirements for cold-formed steel structural members.
- F Manufacturer Reports: Include research reports indicating compliance with applicable building codes.
- G Inspection Reports: Provide material verification Inspection Reports in accordance with requirements of AISI S240.
- H Inspection Reports: Provide Inspection Reports for welding, mechanical fastening, and cold-formed steel light-frame construction in accordance with requirements of AISI S240.
- I Manufacturer's Installation Instructions: Provide installation instructions for connectors.
- J Installation Drawings: Indicate dimensioned locations of cold-formed steel structural framing.
- K Manufacturer's Qualification statement.
- L Testing Agency Qualification Statement.
- M Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before the start of scheduled welding work.

## 1.5 QUALITY ASSURANCE

- A See Section 01 40 00 - Quality Requirements for additional requirements.
- B Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.
- C Manufacturer Qualifications:
  - 1. Company specializing in manufacturing the types of products specified in this section, and with minimum 3 years of documented experience.
- D Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.

- E Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A Comply with requirements for Contractor's design-related professional design services indicated in Section 01 40 00 - Quality Requirements.

### 2.2 MATERIALS

- A Material and Product Requirements Criteria: AISI S201.  
B Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.  
1. Structural Grade: As required to meet design criteria.  
2. Corrosion Protection Coating Designation: CP 60 in accordance with AISI S240.

### 2.3 STRUCTURAL FRAMING COMPONENTS

- A Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.  
1. Structural Grade: As required to meet design criteria.  
2. Corrosion Protection Coating Designation: CP 60 in accordance with AISI S240.  
3. Thickness and Depth: Depth as indicated on the drawings; thickness and structural grade as required to meet design criteria.  
4. Provide components fabricated from ASTM A1011/A1011M Designation SS (structural steel).  
B Jamb Studs: AISI S240; manufactured, engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.  
1. Structural Grade: As required to meet design criteria.  
2. Corrosion Protection Coating Designation: CP 60 in accordance with AISI S240.  
3. Thickness and Depth: Depth as indicated on drawings; thickness and structural grade as required to meet specified design criteria.  
C Headers: AISI S240; manufactured, engineered one-member or two-member assemblies, with wide flanges, designed to replace conventional box or nested header framing at openings.  
1. Structural Grade: As required to meet design criteria.  
2. Corrosion Protection Coating Designation: CP 60 in accordance with AISI S240.  
3. Thickness and Depth: Depth as indicated on drawings; thickness and structural grade as required to meet specified design criteria.  
4. Jamb Mounting Clips: Manufacturer's standard.  
5. Cripple Stud Clips: Manufacturer's standard.

### 2.4 CONNECTIONS

- A Performance Requirements: Provide connections in compliance with requirements of AISI S240.  
B Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.  
C Structural Performance: Maintain load and movement capacity required by applicable building code and specified design criteria.  
D Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.  
1. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.  
2. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 10 feet.

- E Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connectors where indicated on the drawings.

## 2.5 MISCELLANEOUS CONNECTIONS

- A Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.
- B Anchorage Devices: Powder actuated.
- C Welding: Comply with AWS D1.1/D1.1M.

## 2.6 ACCESSORIES

- A Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
- C Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Verify that substrate surfaces are ready to receive work.
- B Verify field measurements and adjust installation as required.

### 3.2 PREPARATION

- A Structural Wall Foundations: For gaps between wall bottom track and top of foundation 1/4 inch or greater, level substrate with loadbearing shims or grout between track and foundation.

### 3.3 INSTALLATION - GENERAL

- A Install structural members and connections in compliance with ASTM C1007.

### 3.4 INSTALLATION OF STUDS

- A Install wall studs plumb and level.
- B Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- C Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
- D Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.
- E Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- F Install intermediate studs above and below openings to align with wall stud spacing.
- G Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.
- H Attach cross studs to studs for attachment of fixtures anchored to walls.
- I Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

### 3.5 FIELD QUALITY CONTROL

- A See Section 01 40 00 - Quality Requirements, for additional requirements.
- B Provide material verification inspections in accordance with requirements of AISI S240.
- C Provide inspections for welding, mechanical fastening, and cold-formed steel light-frame construction in accordance with requirements of AISI S240.
- D Coordination of Other Tests and Inspections: Owner will employ independent testing agency to test and/or inspect; provide access as required to accommodate timely performance.

3.6 TOLERANCES

- A Studs - Vertical Alignment (Plumbness):  $1/960$  of span or  $1/8$  inch in 10 ft, in accordance with ASTM C1007.
- B Stud Spacing:  $1/8$  inch from the designated spacing, provided that the cumulative error does not exceed the requirements of the finishing materials in accordance with ASTM C1007.

END OF SECTION 05 40 00

## SECTION 05 44 00 - COLD-FORMED METAL TRUSSES

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A Light gauge cold-formed steel roof trusses.
- B Anchorages, bracing, and bridging.

## 1.2 REFERENCE STANDARDS

- A AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- E AWS D1.1/D1.1M - Structural Welding Code - Steel.
- F AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- G CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A Pre-Installation Meeting: Meet at project site prior to beginning of installation to review requirements. Require attendance by representatives of the following:
  - 1. Truss fabricator.
  - 2. Truss installer.
  - 3. Other entities affected by the work of this section, including but not limited to truss support framing installer, mechanical systems installer, and electrical systems installer.

## 1.4 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Span charts.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C Shop Drawings:
  - 1. Include detailed roof truss layout.
  - 2. Show member type, location, spacing, size and gauge, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.
  - 3. Include truss design drawings, signed and sealed by a qualified professional engineer registered in North Carolina verifying ability of each truss design to meet applicable code and design requirements.
    - a. Include the following:
      - 1) Design criteria.
      - 2) Engineering analysis depicting member stresses and deflections.
      - 3) Member sizes and gauges.
      - 4) Details of connections at truss joints.
      - 5) Truss support reactions.
      - 6) Bracing requirements.
- D Steel Framing Industry Association (SFIA) Certification:
  - 1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.
- E Designer's Qualification Statement.
- F Fabricator's Qualification Statement.
- G Installer's Qualification Statement.

- H Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months. If welding is required by the supplier.

#### 1.5 QUALITY ASSURANCE

- A Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in North Carolina.
- B Fabricator Qualifications: Steel truss fabricator with minimum 10 years of experience designing and fabricating truss systems equivalent to those required for this project and licensed by an acceptable manufacturer.
- C Installer Qualifications: Experienced installer approved by truss system fabricator.
- D Welder Qualifications: Welding processes and welding operators qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M. If welding is required by the supplier.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A Deliver trusses and other materials in manufacturer's unopened bundles or containers, each marked with manufacturer's name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.
- B Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.
- C Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

### PART 2 PRODUCTS

#### 2.1 TRUSS DESIGN REQUIREMENTS

- A Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100.
- B Structural Performance: Design, engineer, fabricate, and erect trusses to withstand specified design loads for project conditions within required limits.
1. Design Loads: As indicated on drawings.
    - a. Roof Live Loads:
      - 1) Minimum Uniformly Distributed: As indicated on drawings.
      - 2) Minimum Concentrated: As indicated on drawings.
  2. Deflections: Live load deflection meeting the following, unless otherwise indicated:
    - a. Roofs: Maximum vertical deflection under live load of 1/240 of span.
  3. Design trusses to accommodate movement attributable to temperature changes within a range of 120 degrees F without damage or overstressing, sheathing failure, undue strain on fasteners and anchors, or other deleterious effects.

#### 2.2 COMPONENTS

- A Trusses: Light gauge steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.
1. Truss Type, Span, and Height: As indicated on drawings.
  2. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 40,000 psi; minimum G60/Z180 coating; gauges as required for load conditions; all edges rolled or closed.
- B Fasteners: Self-drilling, self-tapping screw fasteners with corrosion-resistant plated finish, as recommended by steel truss manufacturer and marked for easy identification.
1. Welding: Comply with applicable provisions of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

- C Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gauges as required for load conditions.

### 2.3 FABRICATION

- A Factory fabricate cold-formed steel trusses plumb, square, true to line, and with secure connections, complying with manufacturer's recommendations and project requirements.
1. Fabricate trusses using jig templates.
  2. Cut truss members by sawing, shearing, or plasma cutting.
  3. Fasten members in full compliance with instructions of manufacturer. Wire tying of framing members is not permitted.
- B Tolerances: Fabricate trusses to maximum allowable tolerance variation from plumb, level and true line of 1/8 inch in 10 feet.
1. Up to 30 feet Long: Maximum plus or minus 1/2 inch from design length.
  2. Over 30 feet Long: Maximum plus or minus 3/4 inch from design length.
  3. Up to 5 feet High: Maximum plus or minus 1/4 inch from design height.
  4. Over 5 feet High: Maximum plus or minus 1/2 inch from design height.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Examine structure, substrates, and installation conditions. Notify Architect of unsatisfactory preparation. Do not begin installation until substrates have been properly prepared and unsatisfactory conditions have been corrected.
- B Proceeding with installation indicates installer's acceptance of substrate conditions.

### 3.2 INSTALLATION

- A Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.
- B Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.
- C Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.
- D Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.
- E Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect or the engineer of record and the truss manufacturer.
- F Repair or replace damaged members and complete trusses as directed and approved in writing by Architect or the engineer of record and the truss manufacturer.
- G Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.
- H Field Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M, as applicable, and as follows:
1. Connections: Provide fillet, flat, plug, or butt welds, as indicated.
  2. Minimum steel thickness for welded connections, 18 gauge, 0.0478 inch.
- I Roof Trusses:
1. Comply with recommendations of CFSEI 5000.
  2. Align truss bottom chords with load-bearing studs or continuously reinforce track as required to transfer loads to structure.
  3. Install continuous bridging and permanent truss bracing as indicated.
  4. Install roof cross bracing and diagonal bracing as indicated.

3.3 TOLERANCES

- A Install trusses to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.
- B Space individual trusses not more than plus or minus 1/8 inch from plan location. Cumulative error in placement may not exceed minimum fastening requirements of sheathing or other material fastened to trusses.

3.4 FIELD QUALITY CONTROL

- A Owner will provide inspection service for inspection of field connections, in accordance with requirements of Section 01 40 00 - Quality Requirements.

3.5 PROTECTION

- A Protect trusses from damage by subsequent construction activities.
- B Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by Architect or the engineer of record and the truss manufacturer for all cutting, repairs, and replacements.

END OF SECTION 05 44 00

## SECTION 05 51 13 - METAL PAN STAIRS

## 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 Specification Section.

## 1.2 SUMMARY

- A Section Includes:
  - 1. Preassembled steel stairs with concrete-filled treads.
  - 2. Handrails attached to walls adjacent to metal stairs.
  - 3. Supplementary components and accessories normally furnished or otherwise necessary for a complete installation.

## 1.3 REFERENCES

- A Acronyms and Abbreviations:
  - 1. AWS: American Welding Society.
  - 2. GPR: Ground Penetrating Radar.
  - 3. NAAMM: National Association of Architectural Metal Manufacturers.
  - 4. NOMMA: National Ornamental and Miscellaneous Metals Association.
  - 5. SSPC: The Society for Protection Coatings (now AMPP).

## 1.4 COORDINATION

- A Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B Coordinate installation of anchorages for metal stairs and railings.
  - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
  - 2. Deliver such items to Project site in time for installation.
- C Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure, as applicable.
- D Schedule installation of railings and guards so wall attachments are made only to completed walls.
  - 1. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## 1.5 SUBMITTALS

- A Action Submittals:
  - 1. Product Data: For metal pan stairs and the following; include Environmental Product Declaration.
    - a. Shop primer products.
    - b. Handrail wall brackets.
    - c. Grout.
  - 2. Shop Drawings:
    - a. Include plans, elevations, sections, details, and attachments to other work.
    - b. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
    - c. Include plan at each level.
    - d. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

3. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer licensed in the State of North Carolina responsible for their preparation.
- B Informational Submittals:
1. Qualification Data: For professional engineer.
  2. Welding certificates.
  3. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

#### 1.6 QUALITY ASSURANCE

- A Professional Engineer Qualifications: A professional engineer experienced with providing delegated design engineering services of the kind indicated, including documentation that engineer is a licensed engineer in the state of North Carolina.
- B Installer Qualifications: Fabricator of products.
- C Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A Store materials to permit easy access for inspection and identification.
1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  2. Protect steel members and packaged materials from corrosion and deterioration.
  3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
    - a. Repair or replace damaged materials or structures as directed.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A Delegated Design: Engage a qualified professional engineer licensed in the State of North Carolina to design stairs and railings, including attachment to building construction.
1. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- B Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Loads: Uniform and concentrated loads need not be assumed to act concurrently.
    - a. Uniform Load: 100 lbf/sq. ft.
    - b. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  2. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- C Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Handrails and Top Rails of Guards: Uniform and concentrated loads need not be assumed to act concurrently.
    - a. Uniform Load: 50 lbf/ ft. applied in any direction.
    - b. Concentrated Load: 200 lbf applied in any direction.
  2. Infill of Guards: Infill load and other loads need not be assumed to act concurrently.
    - a. Concentrated Load: 50 lbf applied horizontally on an area of 1 sq. ft.

## 2.2 MANUFACTURERS

- A Manufacturers: Subject to compliance with the Contract Documents, provide steel stair assemblies by one of the following.
1. Alfab, Inc. (STAIRCO)
  2. American Stair, Inc.
  3. Duvinage, LLC. (Sharon Stairs)

## 2.3 METALS, GENERAL

- A Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
1. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C Steel Tubing: ASTM A 500/A 500M (cold formed) or ASTM A 513/A 513M.
- D Steel Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- E Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

## 2.4 FASTENERS

- A General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941/ASTM F 194M, Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
1. Maximum penetration of fasteners in slab shall be limited to 3/4-inch to avoid damaging the post tensioning tendons in the upper (ceiling) slab and the floor slab.
- B Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.
- C Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- D Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
- E Anchors, General: Anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Use 0.145-inch diameter power-actuated fasteners.
- F Post-Installed Anchors: Torque-controlled expansion anchors, unless otherwise indicated. Installation of post-installed expansion anchors or torque-controlled anchors in the upper (ceiling) slab and the floor slab requires X-ray or GPR of area to avoid damaging post-tensioned tendons.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

## 2.5 MISCELLANEOUS MATERIALS

- A Handrail Wall Brackets: As selected by the Architect.
- B Welding Rods and Bare Electrodes: Comply with AWS requirements.
- C Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- D Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

- E Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.
- F Concrete Materials and Properties: Comply with requirements in Section 03 30 00 Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a 28-day compressive strength of at least 3000 psi unless otherwise indicated.

## 2.6 FABRICATION, GENERAL

- A Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B Assemble stairs and railings in shop to greatest extent possible.
  - 1. Disassemble units only as necessary for shipping and handling limitations.
  - 2. Clearly mark units for reassembly and coordinated installation.
- C Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- D Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E Form exposed work with accurate angles and surfaces and straight edges.
- F Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with the NOMMA publication Voluntary Joint Finish Standards as follows:
    - a. Commercial Class Stairs: Finish #2 - Completely sanded joint with some undercutting and pinholes okay.
- G Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
  - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
  - 2. Locate joints where least conspicuous.
- H Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## 2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A NAAMM Stair Standard: Comply with the NAAMM publication *AMP 510, Metal Stairs Manual* for the following, unless more stringent requirements are indicated.
  - 1. Enclosed Stairwell: Commercial class.
- B Stair Framing:
  - 1. Stringers: Fabricate of steel plates or channels, or as indicated on the Drawings.
    - a. Stringer Size: As required to comply with "Performance Requirements" Article and as indicated on the Drawings.
    - b. Provide closures for exposed ends of channel stringers.
  - 2. Platforms: Construct of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article and as indicated on the Drawings.
    - a. Provide closures for exposed ends of channel and rectangular tube framing.

3. Weld stringers to headers; weld framing members to stringers and headers.
  4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
    - a. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
  5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.
  2. Architectural Class Stairs: Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
  3. Commercial Class Stairs: Either directly weld metal pans to stringers as above, or attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
  4. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication for concrete-filled tread stairs.
  5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
- 2.8 FABRICATION OF STAIR RAILINGS FOR ENCLOSED STAIRWELLS
- A Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
- B Welded Connections: Fabricate railings and guards with welded connections.
1. Cope components at connections to provide close fit, or use fittings designed for this purpose.
  2. Weld all around at connections, including at fittings.
  3. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  4. Obtain fusion without undercut or overlap.
  5. Remove flux immediately.
  6. Finish welds to comply with the NOMMA publication *Voluntary Joint Finish Standards* for Finish #2 - Completely sanded joint with some undercutting and pinholes okay as shown in NAAMM AMP 521.
- C Form changes in direction of railings and guards as detailed.
- D For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E Close exposed ends of railing and guard members with prefabricated end fittings.
- F Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G Connect posts to stair framing by direct welding unless otherwise indicated.
- H Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt or with predrilled hole for exposed bolt anchorage as indicated on the Drawings, or if not indicated, as selected by the Architect, and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
- I Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

## 2.9 FINISHES

- A Finish metal stairs after assembly.
- B Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
  1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board assemblies.
- B Do not proceed with installation until unsatisfactory conditions have been corrected.
  1. Installation of stairs and railings indicates acceptance of surfaces and conditions.

### 3.2 INSTALLATION OF METAL PAN STAIRS

- A Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
  1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
  1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
    - a. Clean bottom surface of plates.
    - b. Set plates for structural members on wedges, shims, or setting nuts.
    - c. Tighten anchor bolts after supported members have been positioned and plumbed.
    - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
    - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
      - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
      - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E Fit exposed connections accurately together to form hairline joints.
  1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
  2. Comply with requirements for welding in "Fabrication, General" Article.
- F Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 Cast-in-Place Concrete.

### 3.3 INSTALLATION OF RAILINGS AND GUARDS

- A Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
1. Space posts at spacing indicated or, if not indicated, as required by design loads.
  2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet
  3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet
  4. Secure posts and rail ends to building construction as follows:
    - a. Anchor posts to steel by welding or bolting to steel supporting members.
    - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.
- B Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.

### 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 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide at least a 2.0-mil dry film thickness.

END OF SECTION 05 51 13

October 06, 2025

University of North Carolina at Wilmington  
Housing Village Phase 3  
Early Procurement Packages

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SCO 24-29053-02A

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## SECTION 08 53 13 - VINYL WINDOWS

## 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 Specification Section.

## 1.2 SUMMARY

- A Section Includes:
  - 1. Vinyl windows.
  - 2. Supplementary components and accessories normally furnished or otherwise necessary for a complete application.

## 1.3 REFERENCES

- A Acronyms and Abbreviations:
  - 1. FGIA: Fenestration and Glazing Industry Alliance.
  - 2. NFRC: National Fenestration Rating Council.
  - 3. WDMA: Window and Door Manufacturers Association.
- B Definitions:
  - 1. Manufacturer: Means the vinyl window manufacturer unless otherwise indicated.
  - 2. Window: Means the vinyl window.

## 1.4 SUBMITTALS

- A Action Submittals:
  - 1. Product Data: For each type of product.
    - a. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes.
  - 2. Shop Drawings: Show plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
  - 3. Product Schedule: For windows. Use same designations indicated on Drawings.
- B Informational Submittals:
  - 1. Product Test Reports: For each type of window, for tests performed by a qualified testing agency or by the manufacturer and witnessed by a qualified testing agency.
  - 2. Field Quality-Control Reports: For windows.

## 1.5 QUALITY ASSURANCE

- A Testing Agency Qualifications: An FGIA-accredited testing agency for testing indicated.

## PART 2 PRODUCTS

## 2.1 SOURCE LIMITATIONS

- A Obtain windows from single source from the same manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A Design Pressure Rating: DP 50.
- B Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
  - 1. Thermal Transmittance (U-factor): As determined in accordance with NFRC 100.
    - a. Fixed Windows: Not more than 0.32 Btu/sq. ft. x h x deg F.
  - 2. Solar Heat-Gain Coefficient (SHGC): As determined in accordance with NFRC 200.
    - a. Fixed Windows: Not more than 0.29.

## 2.3 VINYL WINDOWS

- A Windows: Provide manufacturer's standard window assemblies consisting of frames, glass, fasteners, and all components and accessories as required for a complete installation.
  - 1. Basis-of-Design Product: Subject to compliance with the Contract Documents design is based on the following.
    - a. "6060 PWNJ" as manufactured by MGM Industries.
  - 2. Acceptable Manufacturers: Subject to compliance with the Contract Documents provide the basis-of-design products or approved products by one of the following.
    - a. Pella Corporation.
    - b. Quaker Windows and Doors.
- B Operating Type: Fixed.
- C Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Finish: Integral color as selected by the Architect.
  - 2. Gypsum Board Returns: Provide at interior face of frame.
- D Glass: Clear annealed glass, ASTM C 0136, Type 1, Class 1, q3.
- E Insulating-Glass Units: ASTM E 2190.
  - 1. Glass: ASTM C1036, Type 1, Class 1, q3.
    - a. Kind: Fully tempered where indicated on Drawings.
  - 2. Lites: 2; verify thickness with Architect.
  - 3. Filling: Fill space between glass lites with air.
  - 4. Low-E Coating: Manufacturer's standard on second surface.
- F Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Avoid exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 ACCESSORIES

- A Dividers (False Muntins): Provide divider grilles in design indicated.
  - 1. Quantity and Type: One permanently located between insulating-glass lites unless otherwise indicated.
  - 2. Material: Manufacturer's standard.
  - 3. Pattern: As indicated on Drawings.
  - 4. Profile: As selected by Architect from manufacturer's full range.
  - 5. Color: As selected by Architect from manufacturer's full range.

## 2.5 FABRICATION

- A Fabricate windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B Glaze windows in the factory.
- C Complete fabrication, assembly, finishing, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Examine openings, substrates, structural support, anchorage, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B Verify rough opening dimensions, levelness of sill plate, and operational clearances.

- C Examine wall flashings, air and weather barriers, and other built-in components to ensure weathertight window installation.
- D Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 1. Installation of windows indicates acceptance of surfaces and conditions.

### 3.2 INSTALLATION

- A Comply with manufacturer's written instructions for installing windows, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

### 3.3 FIELD QUALITY CONTROL

- A Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B Testing Services: Testing and inspecting of installed windows to take place as follows:
  - 1. Testing Methodology: Testing of windows for air infiltration and water resistance will be performed in accordance with AAMA 502.
  - 2. Air-Infiltration Testing:
    - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
  - 3. Water-Resistance Testing:
    - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    - b. Allowable Water Infiltration: No water penetration.
  - 4. Testing Extent: 3 windows as selected by Architect and a qualified independent testing and inspecting agency. Windows will be tested at 5, 50, and 90 percent completion.
  - 5. Test Reports: Prepared in accordance with AAMA 502.
- C Test and Inspections:
  - 1. Windows will be considered defective if they do not pass tests and inspections.
- D Prepare test and inspection reports.

### 3.4 CLEANING AND PROTECTION

- A Clean exposed surfaces immediately after installing windows using manufacturer's written instructions. Remove excess sealants, glazing materials, dirt, and other substances.
- B Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- C Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately in accordance with manufacturer's written instructions.

END OF SECTION 08 53 13

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## SECTION 14 21 23.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

## 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 Specification Section.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Machine-room-less electric traction elevators.
  - 2. Supplementary components and accessories normally furnished or otherwise necessary for a complete installation.

## 1.3 REFERENCES

- A. Acronyms and Abbreviations:
  - 1. ADA: Americans With Disabilities Act.
  - 2. AHJ: Authority (Authorities) Having Jurisdiction.
  - 3. ASME: American Society of Mechanical Engineers.
  - 4. AWS: American Welding Society.
  - 5. USDOJ: United States Department of Justice.
- B. Definitions:
  - 1. General: Definitions in ASME A17.1/CSA B44 apply to work of this Specification Section.
  - 2. Elevator(s): Means the machine room-less electric traction passenger elevator(s).
  - 3. Manufacturer: Means the elevator manufacturer unless otherwise indicated.

## 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data: Include the following:
    - a. Capacities, sizes, performances, operations, safety features, finishes, and similar information.
    - b. Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
    - c. Current Environmental Product Declaration.
  - 2. Shop Drawings:
    - a. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
    - b. Include large-scale layout of car-control station.

- c. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

B. Informational Submittals:

1. Qualification Data: For installer.
2. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

C. Closeout Submittals:

1. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
2. Submit manufacturer's or Installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44.
3. Inspection and Acceptance Certificates and Operating Permits: As required by the AHJ for normal, unrestricted elevator use.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

## 1.7 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of work specified in other Specification Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with applicable requirements for accessible elevators in the USDOJ publication *2010 ADA Standards for Accessible Design* and ICC A117.1.

## 2.2 MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system. Confirm with Architect that specified features and operation comply with Owner requirements.
1. Basis-of-Design Product: Subject to compliance with the Contract Documents the design is based on the following.
    - a. "Gen3 Edge" as manufactured by Otis Elevator Company.
  2. Acceptable Manufacturers: Subject to compliance with the Contract Documents provide the basis-of-design product or comparable approved product by one of the following.
    - a. Schindler Elevator Corporation.
    - b. TK Elevator.
- B. Elevator Description:
1. Rated Load: 3500 lb.
  2. Freight Loading Class for Service Elevator(s): Class A.
  3. Rated Speed: 200 fpm.
  4. Dispatching and Operation System: RSR Plus, Simplex.
  5. Power Supply: 208 volts, 3-PH AC, 60 Hz; verify with Architect.
  6. Standard Features:
    - a. Access key switches at top and bottom landings.
    - b. Firefighter's service, Phase I and II.
    - c. Standard Braille markings
    - d. "OPTIGUARD 3D" door protection system.
    - e. Sleep Mode Operation
    - f. "Otis ONE Pro".
    - g. Emergency car lighting.
    - h. Hoistway access alarm system.
  7. Auxiliary Operations:
    - a. Standby power operation.
    - b. Standby-powered lowering.
    - c. Battery-powered automatic evacuation.
    - d. Automatic dispatching of loaded car.
    - e. Nuisance-call cancel.
    - f. Automatic operation of lights and ventilation fans.
  8. Car Enclosures:
    - a. Inside Width: As indicated on the Drawings.
    - b. Inside Depth: As indicated on the Drawings.
    - c. Inside Height: As indicated on the Drawings.
    - d. Front Walls (Return Panels): ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
    - e. Car Fixtures: ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
    - f. Side and Rear Wall Panels: ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
    - g. Door Faces (Interior): ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.

- h. Door Sills: Aluminum.
  - i. Ceiling: As selected by the Architect from manufacturer's available configurations and lighting; ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
  - j. Handrails: 1-3/4 inch by 4 inch flat bar; ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish at rear wall of car.
  - k. Floor: Recessed 1-1/4 inch and prepared to receive flooring indicated in Finish Material Schedule on the Drawings.
9. Hoistway Entrances:
- a. Width: As indicated on the Drawings.
  - b. Height: As indicated on the Drawings.
  - c. Type: Single-speed side sliding.
  - d. Frames: ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
  - e. Doors: ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
  - f. Sills: Aluminum.
10. Hall Fixtures: ASTM A 480/A 480M stainless steel, manufacturer's "brushed" finish.
11. Additional Requirements:
- a. Provide inspection certificate.
  - b. Provide hooks for protective pads and 1 complete set of full-height protective pads.

## 2.3 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 05 50 00 Metal Fabrications for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

## 2.4 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations: Verify required auxiliary operations with the Architect.
- C. Security features may not affect emergency firefighters' service.

## 2.5 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begins to close at reduced kinetic energy.

## 2.6 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies to comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible in accordance with NFPA 252 or UL 10B.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the work.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 1. Installation of the elevators indicates acceptance of surfaces and conditions.

### 3.2 INSTALLATION OF MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

- A. Comply with manufacturer's written instructions.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and

doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

- F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
  - 1. Place hall lanterns either above or beside each hoistway entrance.
  - 2. Mount hall lanterns at least 72 inches above finished floor.

### 3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and the AHJ in advance of dates and times that tests are to be performed on elevators.

### 3.4 PROTECTION

- A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:
  - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
  - 2. Provide strippable protective film on entrance and car doors and frames.
  - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
  - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
  - 5. Do not load elevators beyond their rated weight capacity.
  - 6. Engage elevator installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
  - 7. Engage elevator installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator.
- B. Check operation of elevator with Owner's personnel present before date of Final Completion. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Final Acceptance, maintenance service to include 12 months' full maintenance by skilled employees of elevator installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies to be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance during normal working hours.
  2. Perform emergency callback service during normal working hours with response time of 2 hours or less.

END OF SECTION 14 21 23.16

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## SECTION 21 05 15 - FIRE PUMP – ELECTRIC

## PART 1 GENERAL

## 1.1 SCOPE OF WORK:

- A This work shall consist of furnishing all labor, material, equipment and services necessary for the installation of all equipment specified hereinafter.
- B Furnish and install fire pumps, drivers, and controls as indicated on the drawings. The pumps, driver, accessories, and installation shall meet all requirements of NFPA 20 and agencies and authorities having jurisdiction. Equipment and accessories shall be U.L. listed and approved by Factory Mutual.
- C The work includes the furnishing and installation of gauges, meters, starters and accessories for a complete installation.
- D Apparatus and equipment specified herein shall conform to the requirements of Section 21 01 00. Type of equipment, capacity, and general arrangement shall be as indicated on plans and schedules.
- E Without limiting the generality thereof, the work in this section shall include the following items:
  - 1. Fire pump
  - 2. Fire pump controller/Automatic Transfer Switch
  - 3. Fittings
  - 4. Jockey pump
  - 5. Jockey pump controller.
- F NFPA 20 requires an acceptance test for this fire pump installation. It should be conducted by the pump manufacturer's representative, with the pump controller manufacturer, the installing contractor and the project coordinator in attendance. The Engineer shall review and witness the fire pump acceptance tests. The Engineer shall be notified two weeks in advance of the date the acceptance test is being scheduled so that they may be in attendance if scheduling permits. The general contractor shall be responsible for notifying the Engineer.

## PART 2 PRODUCTS

## 2.1 FIRE PUMP:

- A Pump shall be single stage, close coupled, self venting, in-line type.
- B Single Stage, Close coupled, Vertical In-Line Pump:
  - 1. The pump will provide a rated capacity of 750 GPM and a differential pressure of 90 PSI. At 150 percent of rated capacity, the pump shall develop at least 65 percent of its rated head and shall not exceed 140 percent of the rated head at zero capacity. The pump shall be tested at the factory and a test curve shall be submitted showing the performance and horsepower requirements based on this test before final acceptance.
  - 2. The pump shall be a single-stage, close-coupled, vertical in-line design, in cast iron bronze fitted construction with packing bearing directly on a stainless steel or a bronze shaft sleeve. The pump internals shall be capable of being serviced without disturbing piping connections.
  - 3. The pump casing shall be made of cast iron ASTM A278, Class 30 or 35, or ductile iron ASTM A536, Grade 65, with the suction and discharge flanges located on a common centerline, 180 degrees apart, for mounting in the pipeline. The standard pipe flanges shall be drilled for 125# per ANSI B16.1 standard.
  - 4. The pump shall be rated for a minimum of 175 psi working pressure and a maximum of 370 psi with 250# discharge flanges and ductile iron casing.
  - 5. The impeller will be of a cast bronze ASTM B584 – Alloy 875, enclosed type, balanced, keyed to the shaft and secured by a cap screw and lockwasher.
  - 6. The casing wear rings shall be made of bronze and can be easily replaced.
  - 7. The pump shall be direct coupled to the motor shaft for easy maintenance, to minimize impeller run out and reduce noise.

8. The pump shall have a vertical back pullout design that makes servicing simple and fast. The rotating element is easily removed without disturbing the piping.
9. The pump shall have split bronze packing glands for easy packing replacement.
10. The stuffing box shall be furnished with impregnated yarn packing, lantern ring and a catch basin for piping leakage to drain.
11. The pump shall have gauge tappings at the suction and discharge nozzles and vent and drain tappings at the top and bottom.
12. A rubber slinger will be installed on the shaft before the motor to prevent the passage of liquid to the motor.
13. The motor will be the JP frame type.
14. Nameplates and other data plates shall be all corrosion resistant and suitably secured to the pump.
15. Pump manufacturer shall be ISO 9001 certified.

C Accessories

1. Vertical In-Line Fire Pump shall be furnished with the following fittings as standard:
  - a. 3 1/2" dial suction and discharge gauges.
  - b. 3/4" casing relief valve.
2. Other fittings and accessories may include the following, based on the specification:
  - a. Eccentric suction reducer (if required).
  - b. Concentric discharge increaser (if required).

2.2 PUMP CONTROLLER/AUTOMATIC TRANSFER SWITCH:

- A The electric drive controller shall conform to the requirements of NFPA-20 and shall be specifically approved for fire pump service as service entrance equipment. All control equipment shall be mounted in a drip-proof moisture resistance housing and shall be labeled "Fire Pump Controller." The control equipment shall be completely assembled, wired and factory tested. The starter shall be of the star-delta type. The controller shall automatically start the pump on a drop in system pressure, and shall have a manual shut-off. Controller alarms shall be as listed in NFPA-20. A remote alarm panel shall also be installed in the security room and contain the alarms specified in NFPA-20. Fire pump controller shall include automatic transfer switch to automatically start emergency generator set and transfer to emergency power upon loss of commercial power supply.

2.3 JOCKEY PUMP SYSTEM:

- A Provide a jockey pump system that is fully automatic, consisting of a jockey pump, jockey pump controller and other appurtenances and specified as follows:
1. Jockey Pump: The jockey pump to be the centrifugal type, multi-stage, cast-iron casing, bronze impeller and wear rings, packing or mechanical seals, threaded suction and discharge connections and a close coupled, open, drip-proof motor.
  2. Jockey Pump Controller: Provide a UL/FM approved jockey pump controller that is fully automatic, enclosed in a NEMA 1 general purpose cabinet, across the line starter with three-leg overcurrent protection, 3-pole fusible disconnect switch, HOA selector switch, bourdon tube type pressure regulator and a minimum running period timer.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS:

- A All items under this Section shall be installed in strict accordance with the manufacturer's recommendations and NFPA.
- B All required accessories and fittings required for the complete pump installation, and as required by NFPA, shall be furnished and installed.

- C The drawings are diagrammatic and the final arrangement of the work shall suit field conditions, the characteristics of the materials used and the instructions of the engineer. Verify all dimensions in the field. Access and clearances must be provided and maintained for the proper operation, maintenance service and repair of the work.

### 3.2 INSTALLATION, GENERAL:

- A Install the fire pump systems and accessories as indicated on the drawings. The installation shall be supervised by a factory authorized representative. He shall conduct final field acceptance tests and instruct the Owner in operation and maintenance of the systems.
- B Coordinate and arrange the fire pump systems and accessories and all associated pipe, valves and fittings to fit the available space allocated. Maintain clearances for access and maintenance.
- C Jockey Pump Operation: The jockey pump shall maintain pressure on the sprinkler system at all times. It shall start when pressure in the sprinkler system drops to slightly above the pressure for which the fire pump is set to begin operation and shall shut off when the desired pressure in the system is obtained. If the jockey pump cannot maintain proper sprinkler system pressure the fire pump shall start.

### 3.3 FACTORY TESTS FOR PUMP:

- A Prior to shipment the pump and driver shall be thoroughly shop tested by the pump manufacturer in conformance with the requirements of NFPA 20. A characteristics curve showing the pump performance based upon the results of the shop test be furnished to the purchaser.
- B The control panel shall be fully assembled and factory tested by the control manufacturer prior to shipment.

END OF SECTION 21 05 15

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## SECTION 21 05 30 - MANUAL WET STANDPIPE AND SPRINKLER SYSTEMS

## PART 1 GENERAL

## 1.1 SCOPE

- A This work shall consist of furnishing all labor, material, equipment and services necessary for the installation of all equipment specified hereinafter.
- B Systems, piping and components principally relevant to this section include:
  - 1. Fire Department Valves
  - 2. Water Flow Indicators
  - 3. Pipe and Fittings
  - 4. Valves

## 1.2 QUALITY ASSURANCE

- A Manufacturers:
  - 1. Firms regularly engaged in the manufacture of fire sprinklers and piping accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B NFPA Code:
  - 1. Comply with NFPA No. 13-2013 Edition, "Standard for the Installation of Sprinkler Systems"
- C FM Compliance:
  - 1. The contractor shall comply with the seismic requirements of the 2012 NC Building Code Chapter 16 and NFPA-13 2013 Edition
- D UL Labels:
  - 1. Provide fire sprinkler piping products which have been approved and labeled by Underwriters Laboratories.
- E Local Fire Department/Marshall Regulations:
  - 1. Comply with governing regulations pertaining to fire sprinkler piping.

## PART 2 PRODUCTS

## 2.1 FIRE DEPARTMENT VALVES

- A 2-1/2" angle valve shall be complete with rough brass body, wheel handle, cap and chain, and escutcheon plate. The valve pressure rating shall be based on the maximum fire pump generated pressure.

## 2.2 SPRINKLER HEADS

- A Heads shall be quick response upright, pendant, recessed, or concealed as indicated on the plans and as required for duty performed, and of ordinary degree rating unless otherwise noted.

## 2.3 WATER FLOW INDICATORS

- A Flow indicators shall be provided where shown on the drawings and designed to operate either on drop in pressure or water flow. They must operate reliably on any flow of water amounting to 10 gallons or more per minute and shall not be subject to false alarms due to water hammer or sudden increase in pressure. A retard element shall be provided, adjustable up to approximately 60 seconds delay. All working parts shall be of corrosion resisting metal. Flow indicators shall be suitable for 175 psi water working pressure and provided with electrical contact unit such as to perform the functions described.

## 2.4 PIPE AND FITTINGS

- A Piping shall be Schedule 10, for sizes 2-1/2" and larger. Piping shall be Schedule 40 for sizes 1" through 2". Fittings shall be black cast iron, Class A. Drain piping above ground shall be galvanized. Piping and fittings subjected to pressures over 175 psi shall be rated at 250 psi. Piping located in pool support areas shall be field painted with an epoxy paint suitable for exposed chlorine environment.

## 2.5 VALVES

- A All valves shall be butterfly type rated suitable for 175 psi working water pressure.
- B Riser and sectional control valves shall be butterfly type with integral tamper. Each tamper switch shall be wired to supervisory panel by Electrical Contractor.
- C Drainage and test valves shall be all-bronze, ball or globe type with screw ends.
- D Check valves 2 inch and smaller shall be all bronze with screw ends. Check valves 2-1/2 inch and larger iron body, brass mounted with flange ends and non-ferrous metal seat rings and bearings.

## PART 3 EXECUTION

### 3.1 TESTING

- A Sprinkler system shall be tested and proved tight under 200 PSI water pressure. All leaks shall be made tight by natural means. No caulking shall be allowed. Contractor shall furnish, connect and operate pump required for testing and shall bear all other expense of tests. The above tests shall be made before painting is done and prior to installation of finished ceilings in areas where pipe is installed above ceiling. This test shall be made prior to making request for final inspection by the Architect. Copies of standard Contractor's Certificate of Test and Material shall be furnished to both the insurance underwriters and the Architect.

### 3.2 INSTALLATION OF PIPING

- A Sprinkler piping shall be installed in strict accordance with NFPA, latest edition.

### 3.3 VALVES

- A Valves shall be installed at all points noted on drawings by standard symbols or as required by best general practice for proper control and operation of the system.

END OF SECTION 21 05 30

## SECTION 22 04 20 - SUMP PUMPS

## PART 1 GENERAL

## 1.1 SCOPE OF WORK

- A This work shall consist of furnishing all labor, material, equipment, and services necessary for the installation of all equipment specified hereinafter.

## 1.2 SHOP DRAWINGS

- A Shop drawings shall be submitted on all equipment including the following:
  - 1. Sump pumps
  - 2. Other items where shown on the drawings or as specified.
- B All equipment manufacturers shall be made by company with not less than 5 years successful service in this country and in similar installments.

## PART 2 PRODUCTS

## 2.1 SUBMERSIBLE SUMP PUMP

- A Provide submersible sump pumps as indicated, of size and capacity as scheduled.
- B Pump: Aluminum alloy shell, bronze impeller, stainless steel shaft, factory sealed grease lubricated ball bearings, ceramic mechanical seal, and perforated steel strainer.
- C Motor: Hermetically sealed, capacitor-start, with built in overload protection, electrical characteristics as scheduled. Provide 10' or 3-conductor PVC breather type cord and molded grounding plug.
- D Controls: Float operated mercury switch or as noted. Provide a control panel for pump shut down and alarm with dry contacts.
- E Available Manufacturers: Subject to compliance with requirements, manufacturers offering submersible sump pumps which may be incorporated in the work include, but are not limited to the following:
  - 1. Goulds
  - 2. Grundfos
  - 3. Bell & Gossett

## PART 3 EXECUTION

## 3.1 SUBMERSIBLE SUMP PUMPS

- A Install submersible sump pumps as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.
- B Set pump in sump. Connect discharge piping check valve and union.
- C Electrical: Refer to Division 26 for power wiring, not work of this section.
- D Start-up: Start-up, test, and adjust sump pumps in accordance with manufacturer's start-up instructions. Check and adjust controls for proper operation.

END OF SECTION 22 04 20 22 04 20

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## SECTION 22 05 23 - VALVES

## PART 1 GENERAL

## 1.1 SCOPE OF WORK

- A This work shall consist of furnishing all labor, material, equipment, and services necessary for the installation of all equipment specified hereinafter.
- B Equipment and components principally relevant to this section include:
  - 1. Gate Valves
  - 2. Check Valves
  - 3. Ball Valves
  - 4. Other items where shown on the drawings or as specified.

## PART 2 PRODUCTS

## 2.1 VALVES - GENERAL

- A Furnish and install valves shown on the drawings, specified herein and/or necessary for the control and easy maintenance of all piping and equipment. All valves shall be first quality of approved manufacture, shall have proper clearances, and shall be tight at the specified test pressure. Each valve shall have the maker's name or brand, the figure or list number and the guaranteed working pressure cast on the body and cast or stamped on the bonnet, or shall be provided with other means of easy identification. All valves shall be the product of one manufacturer except for special applications. Valves shall be Nibco, Hammond, or Fairbanks. Where figure numbers of one manufacturer are stated, equivalent figure numbers can be substituted.
- B Valves shall be of minimum working pressure and materials as fittings specified for the service except as herein modified. All gate valves shall be suitable for repacking under pressure. Regardless of service, valves shall not be designed for less than 125 pounds per square inch steam working pressure.
- C All throttling valves shall have a means of indicating valve position.

## 2.2 BRONZE GATE VALVES

- A Screwed Ends, Union Bonnets, Solid Wedge:
  - 1. Bronze Gates 125 # WSP
    - a. Hammond IB631
    - b. Nibco T-135
    - c. Fairbanks U-0253
- B Solder Ends, Screwed Bonnets:
  - 1. Bronze Gates 125# WSP
    - a. Hammond IB648
    - b. Nibco S-134
    - c. Fairbanks 0282
- C Flanged Ends:
  - 1. Iron Gates 125# WSP
    - a. Hammond IR1140
    - b. Nibco F-617-0
    - c. Fairbanks 0405

## 2.3 CHECK VALVES

- A Screwed ends, Union Bonnets:
  - 1. Bronze Spring Checks 125# WSP
    - a. Nibco T-4480
    - b. Hammond
    - c. Fairbanks

- B Solder Ends, Screwed Bonnets:
  - 1. Stainless Steel or Bronze Spring Checks 125# WSP
    - a. Hammond DFT-GLC
    - b. Nibco
    - c. Fairbanks
- C Flanged Ends
  - 1. Iron Checks 125# WSP
    - a. Hammond IR 1124
    - b. Nibco F-918-B
    - c. Fairbanks 0702
  - 1) BALL VALVES (2" AND BELOW)
  - 2. Nibco T-595W
  - 3. Jenkins 1100T
  - 4. Crane or approved equal

### PART 3 EXECUTION

#### 3.1 GENERAL

- A Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
- B Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
- C Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive installation.
- D Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

END OF SECTION 22 05 23

## SECTION 22 11 23 - DOMESTIC WATER PUMPS FOR PLUMBING

## PART 1 GENERAL

## 1.1 RELATED DOCUMENTS

- A The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR PLUMBING and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B Electric motors shall be furnished with the pumps and shall be of the size and type scheduled or otherwise specified. All motors shall be UL labeled and shall comply with applicable NEMA standard. Motors to be high efficiency type. Refer to Specification Section – ELECTRIC MOTORS, ETC.

## 1.2 SCOPE

- A Shop drawings shall be submitted as required and shall include complete pump specifications, installation and start-up instructions, current and accurate pump performance curves with the selection points clearly indicated, maintenance data and spare parts lists.
- B Pumps shall be factory tested, cleaned, and painted prior to shipment. Size, type, capacity, and electrical characteristics are listed in the pump schedule.
- C Insofar as possible, all pumps shall be by the same manufacturer.

## PART 2 PRODUCTS

## 2.1 PERMANENTLY LUBRICATED INLINE PUMPS:

- A Permanently Lubricated Inline Pumps shall be Series PL as manufactured by Bell & Gossett or equal by Taco, Armstrong, Patterson.
- B The pumps shall be of the horizontal permanently lubricated type, specifically designed for quiet operation. Suitable for 225 degrees Fahrenheit operation at 150 PSIG working pressure.
- C The pumps shall have a solid high-strength alloy steel shaft supported by XL11 permanently lubricated sealed precision bearings. Bearings are to be permanently oil lubricated. Pump shaft shall connect to a non-metallic noryl impeller.
- D Pump shall have integral stainless steel face plate and double-sided stainless-steel neck rings for increased life and seasonal start-up capabilities.
- E Pump volute shall be of cast bronze. The connection style on bronze pumps shall be flanged with isolation valves.
- F The motor shall be isolated from circulating fluid through use of a carbon/silicone seal attached on a stainless steel shaft sleeve.
- G Motors shall be of an Open Drip-Proof design and shall be non-overloading at any point on the pump curve. Motors shall be UL and CSA listed.
- H Pump shall be of a maintenance free design and be capable of operating in variable speed (varying voltage) applications.

## 2.2 CLOSED COUPLED INLINE PUMPS:

- A Closed Coupled Inline Pump shall be Series 60 as manufactured by Bell & Gossett or equal by Taco, Armstrong, Patterson.
- B The pumps shall be of a vertical or horizontal installation type specifically designed for quiet operation. Suitable for 225° F operation at 175 PSIG working pressure. The pump shall be single stage, vertical split case design, all bronze construction. The pump internals shall be capable of being serviced without disturbing piping connections.
- C The pumps shall have a solid SAE1045 steel shaft that is integral to the motor. A non-ferrous shaft sleeve shall be employed to completely cover the wetted area under the seal.
- D The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

- E Pump shall be equipped with a mechanical seal assembly. Seal assembly shall have a brass housing, BUNA bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.
- F Pump shaft shall connect to a brass impeller. Impeller shall be hydraulically and dynamically balanced, keyed to the shaft and secured by a locking capscrew or nut.
- G Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.
- H Pump volute shall be of cast iron design for heating systems or cast brass for domestic water systems. The connection style on cast iron and bronze pumps shall be flanged. Volute shall include gauge ports at nozzles.
- I Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.
- J Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.
- K Each pump shall be factory tested and name-plated before shipment.
- L Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR).

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PUMP INSTALLATION

- A Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- B Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

#### 3.3 ALIGNMENT

- A Engage a factory-authorized service representative to perform alignment service.
- B Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.
- C Comply with pump and coupling manufacturers' written instructions.
- D After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

END OF SECTION 22 11 23

## SECTION 22 11 23.13 - DOMESTIC-WATER PACKAGED BOOSTER PUMPS

## 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. Multiplex, variable-speed booster pumps.

## 1.3 ACTION SUBMITTALS

- A Product Data: For each type of product indicated. Include construction details, material descriptions, and dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B Shop Drawings: For booster pumps. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.

## 1.4 CLOSEOUT SUBMITTALS

- A Operation and Maintenance Data: For booster pumps to include in emergency, operation, and maintenance manuals.

## 1.5 QUALITY ASSURANCE

- A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B ASME Compliance: Comply with ASME B31.9 for piping.
- C UL Compliance for Packaged Pumping Systems:
  - 1. UL 508, "Industrial Control Equipment."
  - 2. UL 508A, "Industrial Control Panels."
  - 3. UL 778, "Motor-Operated Water Pumps."
  - 4. UL 1995, "Heating and Cooling Equipment."
- D Booster pumps shall be listed and labeled as packaged pumping systems by testing agency acceptable to GSFIC.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A Retain protective coatings and flange's protective covers during storage.

## 1.7 COORDINATION

- A Coordinate sizes and locations of concrete bases with actual equipment provided.

## PART 2 PRODUCTS

## 2.1 MULTIPLEX, VARIABLE-SPEED BOOSTER PUMPS

- A Basis of Design: Hyfab
  - 1. Acceptable Manufacturers:
    - a. Patterson Pump
    - b. Syncroflo
    - c. Tigerflow
- B Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties, and controls, and mounted on base.

- C Pumps:
1. Type: Vertical inline as defined in HI 1.1-1.2 and HI 1.3 for variable speed, vertical, multi-stage centrifugal pump.
  2. Pumps shall be ANSI/NSC Standard 61 and ANSI/NSF 372 approved.
- D Motors: Single speed, with pre-greased, permanently shielded, ball-type bearings. Select motors that will not overload through full range of pump performance curve.
- E Piping: Stainless-steel pipe and fittings.
- F Valves:
1. Shutoff Valves NPS 2 (DN 50) and Smaller: two-piece, full-port ball valve, in each pump's suction and discharge piping.
  2. Shutoff Valves NPS 2-1/2 (DN 65) and Larger: lug-type butterfly valve, in each pump's suction and discharge piping and in inlet and outlet headers.
  3. Check Valves NPS 2 (DN 50) and Smaller: swing type in each pump's discharge piping.
  4. Check Valves NPS 2-1/2 (DN 65) and Larger: Silent type in each pump's discharge piping.
  5. Thermal-Relief Valve: Temperature-and-pressure relief type in pump's discharge header piping.
- G Dielectric Fittings: With insulating material isolating joined dissimilar metals.
- H Control Panel: Factory installed and connected as an integral part of booster pump; automatic for multiple-pump, variable-speed operation, with load control and protection functions.
1. Control Logic: Solid-state system with transducers, programmable microprocessor, VFC, and other devices in controller. Install VFC for pump motors larger than 25 hp in separate panel; same type as motor control panel enclosure.
  2. Motor Controller: NEMA ICS 2, variable-frequency, solid-state type.
    - a. Control Voltage: 120-V ac, with integral control-power transformer.
    - b. The VFD shall include as a minimum a 5% dual DC link and AC line reactor for a clean harmonic signature, which aides in complying with IEEE-519-1992 recommended levels. The VFD manufacturer and representative shall assist in ensuring that the VFD's applied meet IEEE-519-1992 by completing a computer aided Harmonic Analysis of the complete system. Refer to electrical drawings and coordinate with electrical contractor for all required information to complete analysis.
  3. Enclosure: NEMA 250, Type 1.
  4. Motor Overload Protection: Overload relay in each phase.
  5. Starting Devices: Hand-off-automatic selector switch for each pump in cover of control panel, plus pilot device for automatic control.
    - a. Duplex, Sequence (Lead-Lag) Starter: Switches lead pump to lag main pump and to two-pump operation.
  6. Pump Operation and Sequencing: Pressure-sensing method.
    - a. Time Delay: Controls pump on-off operation; adjustable from 1 to 300 seconds.
  7. VFC: Voltage-source, pulse-width, modulating-frequency converter for each pump.
  8. Manual Bypass: Magnetic contactor arranged to transfer to constant-speed operation upon VFC failure.
  9. Instrumentation: Suction and discharge pressure gages.
  10. Lights: Running light for each pump.
  11. Alarm Signal Device: Sounds alarm when backup pumps are operating.
    - a. Time Delay: Controls alarm operation; adjustable from 1 to 300 seconds, with automatic reset.
  12. Thermal-bleed cutoff.
  13. Low-suction-pressure cutout.
  14. High-suction-pressure cutout.
  15. Low-discharge-pressure cutout.
  16. High-discharge-pressure cutout.
  17. Direct Digital Control (DDC) System for HVAC: Provide auxiliary contacts for interface to BACnet or LonWorks DDC system. DDC systems are specified in Section 23 0900 "Instrumentation and Control for HVAC." Include the following:

- a. On-off status of each pump.
- b. Alarm status.
- I Base: Structural steel.
- J Capacities and Characteristics: See Schedule on Drawing P0-02.

## 2.2 MOTORS

- A Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in NFPA 70.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A Examine roughing-in for booster pumps to verify actual locations of piping connections before booster-pump installation.

### 3.2 INSTALLATION

- A Equipment Mounting:
  - 1. Install booster pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
- B Support connected domestic-water piping so weight of piping is not supported by booster pumps.

### 3.3 CONNECTIONS

- A Comply with requirements for piping specified in Section 22 05 29 "Hangers, Clamps, Attachments, Etc. for Plumbing." Drawings indicate general arrangement of piping, fittings, and specialties.
- B Connect domestic-water piping to booster pumps. Install suction and discharge pipe equal to or greater than size of system suction and discharge headers.
  - 1. Install shutoff valves on piping connections to booster-pump suction and discharge piping. Install ball, butterfly, or gate valves same size as suction and discharge piping. Comply with requirements for general-duty valves.
  - 2. Install union, flanged, or grooved-joint connections on suction and discharge piping at connection to domestic-water piping. Comply with requirements for unions and flanges specified in Section 22 11 16 "Domestic Water Piping."
  - 3. Install valved bypass, same size as and between piping, at connections to booster-pump suction and discharge piping. Comply with requirements for domestic-water piping specified in Section 22 11 16 "Domestic Water Piping."
  - 4. Install flexible connectors, same size as piping, on piping connections to booster-pump suction and discharge piping. Comply with requirements for flexible connectors specified in Section 22 11 16 "Domestic Water Piping."
  - 5. Install piping adjacent to booster pumps to allow service and maintenance.

### 3.4 IDENTIFICATION

- A Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identifications, Tags, Charts for Plumbing."

### 3.5 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.
- B Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C Tests and Inspections:
1. Perform visual and mechanical inspection.
  2. Leak Test: After installation, charge booster pump and test for leaks. Repair leaks and retest until no leaks exist.
  3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster-pump operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D Pumps and controls will be considered defective if they do not pass tests and inspections.
- E Prepare test and inspection reports.
- 3.6 STARTUP SERVICE
- A Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
- 3.7 ADJUSTING
- A Adjust booster pumps to function smoothly, and lubricate as recommended by manufacturer.
- B Adjust pressure set points.
- C Occupancy Adjustments: When requested within 12 months of date of Materials Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
- 3.8 DEMONSTRATION
- A Train Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

END OF SECTION 22 11 23.13

## SECTION 22 34 00 - FUEL-FIRED, DOMESTIC-WATER HEATERS

## 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. Gas-fired, tankless, domestic-water heaters.
  - 2. Domestic-water heater accessories.

## 1.3 ACTION SUBMITTALS

- A Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B Shop Drawings:
  - 1. Include diagrams for power, signal, and control wiring.

## 1.4 INFORMATIONAL SUBMITTALS

- A Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.
- B Product Certificates: For each type of gas-fired, tankless domestic-water heater.
- C Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- D Source quality-control reports.
- E Field quality-control reports.
- F Sample Warranty: For special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

## 1.6 COORDINATION

- A Coordinate sizes and locations of concrete bases with actual equipment provided.

## 1.7 WARRANTY

- A Special Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.
    - b. Faulty operation of controls.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  - 2. Warranty Periods: From date of Substantial Completion.
    - a. Gas-Fired, Tankless, Domestic-Water Heaters:
      - 1) Heat Exchanger: Fiveyears.
      - 2) Controls and Other Components: Five years.
    - b. Expansion Tanks: Five years.

## PART 2 PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

- B ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.
- C ASME Compliance:
  - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

## 2.2 GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

- A Manufacturers
  - 1. Navien
  - 2. Rinnai
  - 3. Noritz
  - 4. Rheem
  - 5. Lochinvar
- B Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
- C Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.
- D Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.
  - 1. Tappings: ASME B1.20.1 pipe thread.
  - 2. Pressure Rating: 150 psig.
  - 3. Heat Exchanger: Stainless steel.
  - 4. Insulation: Comply with ASHRAE/IES 90.1.
  - 5. Jacket: Metal, with enameled finish, or plastic.
  - 6. Burner: For use with tankless, domestic-water heaters and natural-gas fuel.
  - 7. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
  - 8. Temperature Control: Adjustable thermostat.
- E Support: Back to back multi-unit floor rack.
  - 1. Electrical Characteristics:
    - a. Volts: 120V.
    - b. Phase: Single.
    - c. Hertz: 60 Hz.
  - 2. Minimum Vent Diameter: See drawings.

## 2.3 DOMESTIC-WATER HEATER ACCESSORIES

- A Domestic-Water Expansion Tanks:
  - 1. Manufacturers
    - a. Amtrol
    - b. Watts
    - c. Wessels
    - d. Bell & Gossett
    - e. Zurn
  - 2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
  - 3. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
  - 4. Construction:
    - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    - b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

- c. Air-Charging Valve: Factory installed.
- B Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 2-psig (13.8-kPa) pressure rating as required to match gas supply.
- C Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- D Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.
- E Pressure Relief Valves: Include pressure setting less than working-pressure rating of domestic-water heater.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.
- F Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- G Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heaters the required minimum distance above the floor.

## 2.4 SOURCE QUALITY CONTROL

- A Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.
- B Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C Domestic-water heaters will be considered defective if they do not pass tests and inspections.
- D Prepare test and inspection reports.

## PART 3 EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
  - 1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
  - 2. Maintain manufacturer's recommended clearances.
  - 3. Arrange units so controls and devices that require servicing are accessible.
  - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 8. Anchor domestic-water heaters to substrate.
- B Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters the required minimum distance above floor on floor mounted rack.
  - 1. Maintain manufacturer's recommended clearances.
  - 2. Arrange units so controls and devices that require servicing are accessible.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 5. Anchor domestic-water heaters to substrate.
- C Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
  - D Install gas-fired, domestic-water heaters in accordance with NFPA 54.
    1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
    2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
    3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
    4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."
  - E Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
  - F Install combination temperature and pressure relief valves in water piping for domestic-water heaters without storage. Extend domestic-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
  - G Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
  - H Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
  - I Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
  - J Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
  - K Fill domestic-water heaters with water.
  - L Charge domestic-water expansion tanks with air to required system pressure.
  - M Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.
- 3.2 PIPING CONNECTIONS
- A Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
  - B Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."
  - C Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
  - D Drawings indicate general arrangement of piping, fittings, and specialties.
  - E Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.4 FIELD QUALITY CONTROL

- A Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D Perform tests and inspections with the assistance of a factory-authorized service representative.
- E Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F Domestic-water heaters will be considered defective if they do not pass tests and inspections.
- G Prepare test and inspection reports.

### 3.5 DEMONSTRATION

- A Engage a factory-authorized service representative, if needed, to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired, tankless domestic-water heaters. Training shall be a minimum of one hour(s).

END OF SECTION 22 34 00

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## SECTION 23 34 23 - HVAC POWER VENTILATORS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B AMCA 99 - Standards Handbook; 2025.
- C AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.
- E AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.
- F AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C Manufacturer's Instructions: Indicate installation instructions.
- D Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.

## PART 2 PRODUCTS

## 2.1 POWER VENTILATORS - GENERAL

- A Static and Dynamically Balanced: Comply with AMCA 204.
- B Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D Fabrication: Comply with AMCA 99.
- E Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## 2.2 CEILING EXHAUST FANS

- A Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.
- B Grille: Molded white plastic.
- C Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## PART 3 EXECUTION

## 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.

END OF SECTION 23 34 23

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## SECTION 23 36 00 - AIR TERMINAL UNITS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
- B ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- C ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- D SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- D Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- E Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.
- F Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- G Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

## 1.3 WARRANTY

- A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B Provide five year manufacturer warranty for air terminal units.

## PART 2 PRODUCTS

## 2.1 SINGLE-DUCT, VARIABLE-VOLUME AND CONSTANT-VOLUME UNITS

- A General:
  - 1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
  - 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.
- B Unit Casing:
  - 1. Minimum 22 gauge, 0.0299 inch galvanized steel.
  - 2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
  - 3. Unit Discharge: Rectangular, with slip-and-drive connections.
  - 4. Acceptable Liners:
    - a. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.
- C Damper Assembly:
  - 1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
  - 2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
  - 3. Incorporate low leak damper blades for tight airflow shutoff.

## D Controls:

1. DDC (Direct-Digital Controls):
  - a. Include a field-installed, factory-tested, direct-digital controller.
  - b. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
  - c. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
    - 1) Occupied and unoccupied operating mode.
    - 2) Remote reset of temperature or CFM set points.
    - 3) Proportional, plus integral control of room temperature.
    - 4) Monitoring and adjusting with portable terminal.
  - d. Room Sensor:
    - 1) Compatible with temperature controls specified.
    - 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
  - e. See Section 25 1400.

## PART 3 EXECUTION

## 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C Provide ceiling access doors or locate units above easily removable ceiling components.
- D Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- E Do not support from ductwork.
- F Connect to ductwork in accordance with Section 23 31 00.

END OF SECTION 23 36 00

## SECTION 23 52 16 - CONDENSING BOILERS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.
- B ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2022.
- C ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2021).
- E ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2021.
- F NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); Current Edition.
- G NFPA 54 - National Fuel Gas Code; 2021.
- H SCAQMD 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; 1990, with Amendment (2018).

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.
- C Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.
- D Manufacturer's Factory Inspection Report: Submit boiler inspection prior to shipment.
- E Manufacturer's Field Reports: Burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.
- F Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.
- G Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

## 1.3 WARRANTY

- A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B Provide a five year warranty to include coverage for heat exchanger.

## PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A Natural Gas, Propane, or Combination Natural Gas/Propane for Indoor Applications:
  - 1. Lochinvar LLC; \_\_\_\_\_: [www.lochinvar.com/#sle](http://www.lochinvar.com/#sle).
  - 2. The Fulton Companies; \_\_\_\_\_: [www.fulton.com/#sle](http://www.fulton.com/#sle).
  - 3. Vlessman: [www.viessmann-us.com](http://www.viessmann-us.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.2 MANUFACTURED UNITS

- A Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

- B Unit: Metal membrane wall, water or fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, boiler trim, insulation, and removable jacket, suitable for indoor application.

### 2.3 BOILER CONSTRUCTION

- A Comply with the minimum requirements of ASME BPVC-IV and ANSI Z21.13 for construction of boilers.
- B Assembly to bear the ASME "H" stamp and comply with the efficiency requirements of the latest edition of ASHRAE Std 90.1 I-P.
- C Required Directory Listings:
  - 1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at [www.ahrinet.org](http://www.ahrinet.org).
  - 2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); current edition at [www.nationalboard.org](http://www.nationalboard.org).
- D Heat Exchanger: Construct with materials that are impervious to corrosion where subject to contact with corrosive condensables.
- E Provide adequate tappings, observation ports, removable panels, and access doors for entry, cleaning, and inspection.
- F Insulate casing with insulation material, protected and covered by heavy-gauge metal jacket.
- G Factory apply boiler base and other components, that are subject to corrosion, with durable, acrylic, powder coated, painted, or weather-proofed finish.

### 2.4 BOILER TRIM

- A ASME rated pressure relief valve.
- B Flow switch.
- C Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.
- D Temperature and pressure gauge.
- E Pressure Switches:
  - 1. High gas pressure.
  - 2. Low gas pressure.
  - 3. Air pressure.
- F Manual reset high limit.
- G Boiler Pump (where required by boiler design):
  - 1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
  - 2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.
  - 3. Pump time delay.

### 2.5 FUEL BURNING SYSTEM

- A Provide forced draft automatic burner or pulse combustion, integral to boiler, designed to burn natural gas, propane, and No. 2 fuel oil, and maintain fuel-air ratios automatically.
  - 1. Blower Design: Statically and dynamically balanced to supply combustion air; direct connected to motor.
  - 2. Forced Draft Design: Mixes combustion air and gas to achieve 90 percent combustion efficiency.
  - 3. Pulse Combustion Design: Self-aspirating, not requiring blower for combustion.
  - 4. Combustion Air Filter: Protects fuel burning system from debris.
- B Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.
- C Emission of Oxides of Nitrogen Requirements: Comply with SCAQMD 1146.1 for natural gas fired system, as applicable.

- D Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe.

## 2.6 FACTORY INSTALLED CONTROLS

- A Option for internal or external (0-10) VDC control.
- B Temperature Controls:
  - 1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature.
  - 2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
  - 3. Low-fire start time delay relay.
- C Electronic PI setpoint/modulation control system.
- D Microprocessor-based, fuel/air mixing controls.
- E BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
  - 1. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.
- C Install boiler on concrete housekeeping base, sized minimum of 4 inches larger than boiler base in accordance with Section 03 30 00.
- D Coordinate provisions for water treatment in accordance with Section 23 25 00.
- E Pipe relief valves to nearest floor drain.
- F Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack with suitable piping material to neutralizer prior to discharging into nearest floor drain.
- G Install primary boiler pump in accordance with Section 23 21 23.
- H Provide piping connection and accessories in accordance with Section 23 21 14.
- I Provide for connection to electrical service in accordance with Section 26 05 83.
- J Connect vent combustion generated fumes to breeching, chimney or exhaust stack; see Section 23 51 00.
- K Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 15 00.

### 3.2 CLOSEOUT ACTIVITIES

- A See Section 01 79 00 - Demonstration and Training for additional requirements.
- B Demonstrate proper operation of equipment to Owner's designated representative.
- C Demonstration: Demonstrate operation of system to Owner's personnel.
  - 1. Use operation and maintenance data as reference during demonstration.
  - 2. Briefly describe function, operation, and maintenance of each component.
- D Training: Train Owner's personnel on operation and maintenance of system.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.

END OF SECTION 23 52 16

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## SECTION 23 65 33 - LIQUID COOLERS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
- B ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014 (Reaffirmed 2020).
- C ASME PTC 23 - Atmospheric Water Cooling Equipment; 2003 (Reaffirmed 2023).
- D NEMA MG 00001 - Motors and Generators; 2024.

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide rated capacities, dimensions, weights and point loadings, accessories, required clearances, electrical requirements and wiring diagrams, and location and size of field connections. Submit schematic indicating capacity controls.
- C Shop Drawings: Indicate suggested structural steel supports including dimensions, sizes, and locations for mounting bolt holes.
- D Certificates: Certify that liquid cooler performance, based on ASME PTC 23 meet or exceed specified requirements and submit performance curve plotting leaving water temperature against wet bulb temperature.
- E Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include cleaning methods and cleaning materials recommended.
- G Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- H Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set, matched, for each unit.

## 1.3 DELIVERY, STORAGE, AND HANDLING

- A Factory assemble entire unit. For shipping, disassemble into as large as practical sub-assemblies so that minimum amount of field work is required for re-assembly.
- B Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

## 1.4 WARRANTY

- A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B Provide a five year warranty to include coverage for liquid cooler package, labor.

## PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A TowerTech: [www.towertech-us.com](http://www.towertech-us.com) (Preferred)
- B EVAPCO, Inc; \_\_\_\_\_: [www.evapco.com/#sle](http://www.evapco.com/#sle).
- C SPX Cooling Technologies/Marley; \_\_\_\_\_: [www.spxcooling.com/#sle](http://www.spxcooling.com/#sle).
- D Substitutions: See Section 01 60 00 - Product Requirements.

## 2.2 MANUFACTURED UNITS

- A Provide outdoor units, factory assembled, sectional, counterflow, vertical discharge, forced draft design, with fan assemblies built into pan and casing.

## 2.3 COMPONENTS

- A Pan and Casing: Fiberglass or Stainless Steel

- B Cooler Coil: Steel tubing, air tested under water to 350 psi, sloped to ensure drainage, encased in steel framework. Provide cleanable header unit with removable cover plates on header to access tubular coil.
- C Fans: Multi blade, cast aluminum, axial type, with belt drive, bearings with ABMA STD 9 or ABMA STD 11, L-10 life expectancy at 30,000 hours, with extended grease fittings.
- D Fan Motors: Variable speed (1800/900 rpm) mounted on adjustable steel base. See Section 23 05 13
- E Distribution Section: Polyvinyl chloride piping header and branches with ABS plastic spray nozzles.
- F Finish: Electrostatically sprayed thermosetting polymer.

#### 2.4 INSIDE SUMP

- A Pan and Casing: Galvanized steel, 12 gauge, 0.1046 inch for casing and 8 gauge, 0.1644 inch for reinforcing angles and channels with lift out steel strainer.
- B Finish: Electrostatically sprayed thermosetting polymer.

#### 2.5 CIRCULATING PUMP

- A Pump: Close coupled, bronze fitted, centrifugal pump with mechanical seal, mounted on piping.
- B Pump Control: Pan mounted immersion thermostat set at 140 degrees Fahrenheit.
- C Pump Motor: Single speed (1800/900 rpm) open drip proof mounted on pump body. NEMA MG 1.

#### 2.6 ACCESSORIES

- A Electric Immersion Heaters: In pan suitable to maintain temperature of water in basin at 42 degrees Fahrenheit when outside temperature is 0 degrees Fahrenheit and wind velocity is 15 mph; immersion thermostat and float control to operate heaters on low temperature when pan is filled.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install cooler on structural steel beams as instructed by manufacturer.
- C Connect cooler water piping with flanged connections to cooler. See Section 23 21 13.
- D Connect make-up water piping with flanged or union connections to cooler. Pitch to cooler. Pipe drain, overflow drain, and bleed lint to nearest floor drain. See Section 22 10 05.

END OF SECTION 23 65 33

## SECTION 23 74 33 - DEDICATED OUTDOOR AIR UNITS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.
- C ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- D ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- G UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- H UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- C Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- D Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- E Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.
- F Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- G Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- H Project Record Documents: Record actual locations of components.
- I Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements for additional provisions.
  - 2. Extra Filters: One set of each type and size.

## 1.3 WARRANTY

- A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B Provide five year manufacturers warranty for compressor/condenser unit.

## PART 2 PRODUCTS

## 2.1 ROOF-MOUNTED DOAS

- A Packaged Unit:
  - 1. Casing and Components:
    - a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
    - b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
    - c. Provide bolted access panels to access each sections from either side of unit.
    - d. Provide hinged door with lockable handle for serviceable sections.
    - e. Drain Pan: Galvanized steel with corrosion-resistant coating.
  - 2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.

3. Regulatory Requirements: AHRI 270 (S/I-I-P) rated, NFPA 70, and UL (DIR) listed.
  4. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.
  5. External Surface Finish: Heat resistant baked enamel.
  6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
  7. Outside Air Damper with Rain Hood and Screen:
- B Filter Section:
1. Filter: Removable, 4 inches thick MERV-13.
  2. Monitoring: Provide gauge with loaded setpoint-adjustable signal flag or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.
- C Cooling Section:
1. Water-Source Heat Pump:
    - a. Packaged water-source heat pump with integrated or coordinated controls.
    - b. Compressor Section:
      - 1) Hermetically sealed, direct-driven single-stage scroll or dual-stage scroll type with centrifugal type oil pumps.
      - 2) Motor: Suction gas-cooled with voltage utilization range of plus/minus 10 percent of unit nameplate voltage.
      - 3) Internal spring isolation and sound muffling to minimize vibration transmission and noise.
      - 4) External high-and low-pressure switches.
    - c. Refrigerant Load Control: Provide hot-gas bypass and hot-gas reheat coil.
    - d. Evaporator Section: Internally finned aluminum, copper, or cupro-nickel tubes mechanically bonded to aluminum plate fins.
- D Energy Recovery Section: Provide wheel recovery device fully coordinated with return, exhaust, or return-exhaust fan section.
- E Fan Section:
1. Provide direct or plenum mounted variable-speed fan motors; see Section 23 05 13.
  2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
  3. Factory program for both soft start and constant flow output over static pressure range.
  4. Provide preinstalled neutral wire protection when required to support specified fan type.
  5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
  6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
  7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 23 09 34.
  8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- F Unit Controls:
1. DDC:
    - a. Application Specific Controller; see Section 25 14 00 unless factory-provided.
    - b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
    - c. Coordination and Sequencing:
      - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
      - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.

- 3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freestat.
2. Thermostat:
    - a. Field mounted and wired, tied into prewired control-interface terminals.
    - b. Smart Thermostat:
      - 1) BAS, SCADA, or Integrated Automation linked programmable thermostat; see Section 25 14 00.
    - c. Programmable Thermostat:
      - 1) Electro-mechanical type with key- or pushbutton-operated display.
      - 2) Programmable occupied/unoccupied weekly and holiday schedule.
    - d. Nonprogrammable Thermostat:
      - 1) Electro-mechanical type with key- or pushbutton-operated display.
      - 2) User-configurable, precoded options aligned with equipment functions.
    - e. Thermostat: Single-gang-box-mounted platinum or thermistor.
      - 1) Local Interface to Include:
        - (a) Filter maintenance indicating status.
  3. Airflow Meter:
    - a. Include integral airflow meter station or probe for ventilation, supply, or exhaust airflow in cfm as indicated on drawings.
  4. Local Control Panel: Interface to include on-off-auto switch, heat-off-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
- G Electrical: 480 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.
- H Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.
- C Install unit on vibration isolator pad or roof curb; see Section 23 05 48.
- D Provide flexible duct connections on inlet and outlet from unit; see Section 23 33 00.
- E Connect drain pan outlet to nearest building drain system piping.
- F Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.
- G Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 15 00.

END OF SECTION 23 74 33

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## SECTION 23 81 46 - WATER-SOURCE UNITARY HEAT PUMPS

## PART 1 GENERAL

## 1.1 REFERENCE STANDARDS

- A ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2025.
- B ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2021).
- D ASHRAE Std 13256-1 - Water-Source Heat Pumps - Testing and Rating for Performance - Part 1: Water-to-Air and Brine-to-Air Heat Pumps; 2021.
- E ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
- F UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.
- G UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.
- H UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- I UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

## 1.2 SUBMITTALS

- A See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.
- C Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.
- D Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.
- E Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.
- F Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

## PART 2 PRODUCTS

## 2.1 GENERAL HEAT PUMP FABRICATION REQUIREMENTS

- A Energy Efficiency: ASHRAE Std 90.1 I-P EER and COP ratings, minimum.
- B ASHRAE Std 13256-1, factory-assembled unit including safety-controls, accessories, filters, piping, cables, wires, and precharged with R-454B refrigerant prior to testing.
- C Include marked terminal strip to interface field-mounted components, accessories, and thermostat.
- D Comply with UL 1995; place service and caution labels on unit.
- E Cabinet Assembly:
  - 1. Construct of zinc-coated, heavy-gauge, galvanized steel with exposed edges rounded.
  - 2. Finish: Factory apply electrostatic powder paint or baked enamel finish. Coordinate with Engineer for specific color finish requirements of console units or other units installed within occupied spaces.
  - 3. Provide access panels for inspection, cleaning, and servicing of refrigerant, controls, condensate drain pan, coil, and blower.
  - 4. Furnish 1-inch or 3-inch duct flange on open-discharge selections.
  - 5. Interior Insulation: Minimum 1/2 inch thick, dual density, bonded glass fiber.

6. Provide flame spread of less than 25, and smoke developed classification of less than 50 inch compliance with ASTM E84 and UL 723.
  7. Sound and Noise Suppression:
    - a. Mechanical Rooms: 18 gauge, 0.05 inch, minimum.
    - b. Occupied Spaces: 16 gauge, 0.06 inch, minimum.
    - c. Compressor enclosure lined with 1/2 inch thick insulation.
    - d. Include vibration isolation between compressor and heat exchanger.
    - e. Include length-wise, unit base stiffeners.
    - f. Foam gasket sealant around compressor and end panel perimeter.
- F Blower Section:
1. Draw-through, forward curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
  2. Factory program for both soft start and constant flow output over static pressure range.
  3. Provide preinstalled neutral wire protection when required to support specified fan type.
  4. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
  5. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements.
  6. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units.
  7. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- G Evaporator Section:
1. Internally finned, aluminum or copper tubes mechanically bonded to configured aluminum plate fin, corrosion inhibitor coated as indicated.
  2. Refrigerant Coil Distributor Assembly: Orifice style with round copper distributor tubes.
  3. Thermostatic Expansion Valve: Factory select and install for wide control range.
  4. Factory leak test to minimum 450 psi and pressure test to minimum 600 psi.
  5. Tubes: Size tubes consistent with coil capacity. Fabricate suction header from rounded copper pipe.
  6. Completely evacuate air and charge with proper column of refrigerant prior to shipment.
  7. Drain Pan:
    - a. Construct of ABS plastic, HDPE, stainless steel, or other corrosion-resistant material and flame rated in accordance with UL 94 when using polymers.
    - b. Slope on two planes to pitch condensate to drain connection.
    - c. Float Switch: UL 508, rated for protection against condensate overflow, controller connected.
- H Compressor Section:
1. Provide rubber mounting devices located underneath compressor mounting base.
  2. Safety Interlocked Devices:
    - a. Thermal overload protection.
    - b. High pressure switch for protection against excessive discharge pressure.
    - c. Low pressure safety for protection against loss of refrigerant charge.
- I Refrigerant Tubing Lines:
1. Tubing made of copper with service pressure ports on high- and low-pressure sides.
  2. Free from contaminants and conditions such as drilling fragments, dirt, and oil.
  3. Include drier, thermal expansion valve, and other related components.
  4. Freeze Protection: 30 degrees Fahrenheit, thermistor based.
  5. Insulation: Evaporator and heat exchanger sides; minimum 3/8 inch thick elastomeric insulation.
- J Refrigerant Load Control:
1. Hot-Gas Bypass: Provide to increase heat transfer efficiency at low temperatures.
  2. Hot-Gas Reheat Coil:

- a. Humidity Control: Upgrade thermostat to include humidity sensor tied to unit controller for integral dehumidification control.
  - b. Coil Assembly: Aluminum or copper tubes mechanically expanded into evenly spaced aluminum fins.
  - c. Coil Testing: Proof test at minimum of 1.5 times maximum operating pressure, then leak test at maximum operating pressure.
3. Hot-Water Generator:
- a. Secondary coil or heat exchanger, reversing valve, and accessories.
  - b. Storage: Interconnect to existing water heater or external storage tanks.
- K Water-to-Refrigerant Heat Exchanger:
- 1. Coaxial Type: Provide aluminum or copper tube and fins.
  - 2. Brazed-Plate Type: Stainless steel, with bidirectional liquid line filter drier.
  - 3. Insulate heat exchanger, water lines, and refrigerant suction lines for prevention of condensation at temperatures below 60 degrees Fahrenheit.
  - 4. Provide rubber isolation to heat exchanging device for enhanced sound attenuation.
  - 5. Freeze Protection: 35 degrees Fahrenheit by thermistor sensing.
  - 6. Minimum Working Pressure: 400 psi water side, 600 psi DX side.
  - 7. End Connections: Copper NPT. Provide flow shut-off ball valves.
  - 8. Accessories:
    - a. Strainer, PT test plug, and flow regulator.
    - b. Unit-controlled, return-water-side solenoid valve.
- L Filter Section:
- 1. ASHRAE Std 52.2, minimum efficiency reported value or MERV listing.
  - 2. Filter Box: Provide field-installed return duct-mounted filter housing with side access.
- M Electrical:
- 1. Provide factory-installed phase loss safety device for 3-phase units.
  - 2. Configure unit for single point connection, include terminal for field-installed components.
  - 3. Include separate holes and knockouts with plastic ferrules for respective electrical and controls wiring.
- N Unit Controls:
- 1. DDC:
    - a. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
    - b. Coordination and Sequencing:
      - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
      - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, load-pump contact, source pump contact, and other devices required for operation.
      - 3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.
  - 2. Thermostat:
    - a. Field mounted and wired, tied into prewired control-interface terminals.
    - b. Smart Thermostat:
      - 1) BAS- or BMS-linked programmable thermostat; see Section 25 14 00.
- 2.2 CONSOLE, WATER-SOURCE HEAT PUMP
- A Air Discharge Outlet: Locate on cabinet front side, top side, or sloped-top end.
  - B Compressor: Hermetically sealed, single-stage rotary type.
  - C Water-to-Refrigerant Heat Exchanger: Coaxial type.
  - D Blower Section: Provide 3-speed, electrically commutated motor (ECM) fan type.
  - E Filter Section: Include MERV 4 rated air filter.
  - F Electrical: 120 VAC, 1-phase, 60 Hz.

- G Unit Controls: Factory-supplied DDC with thermostat.
  - 1. BAS, SCADA, or other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.
  - 2. Control Valve: Return-installed, position-adjusted, ball type; see Section 25 35 19.

## 2.3 HORIZONTAL/VERTICAL WATER-SOURCE HEAT PUMP

- A Manufacturers:
  - 1. Trane Technologies, PLC; \_\_\_\_\_: [www.trane.com/#sle](http://www.trane.com/#sle).
  - 2. Daikin Applied: [www.DaikinApplied.com/#sle](http://www.DaikinApplied.com/#sle).
  - 3. WaterFurnace International, Inc: [www.waterfurnace.com/#sle](http://www.waterfurnace.com/#sle).
  - 4. ClimateMaster: [www.climatemaster.com/#sle](http://www.climatemaster.com/#sle).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B Cabinet Air Discharge Configuration: As indicated on drawings.
- C Compressor: Hermetically sealed, single-stage rotary or single-stage scroll type.
- D Water-to-Refrigerant Heat Exchanger: Coaxial type.
- E Blower Section: Provide high-static, permanent split capacitor (PSC) motor fan type.
- F Filter Section: Include MERV 4 rated air filter.
- G Unit Controls: Factory-supplied DDC with thermostat.
  - 1. BAS, SCADA, or other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.
  - 2. Control Valve: Return-installed, position-adjusted, ball type; see Section 25 35 19.

## 2.4 HIGH-EFFICIENCY, DUAL-STAGE, HORIZONTAL/VERTICAL WATER-SOURCE HEAT PUMP

- A Manufacturers:
  - 1. Trane Technologies, PLC; \_\_\_\_\_: [www.trane.com/#sle](http://www.trane.com/#sle).
  - 2. Daikin Applied: [www.DaikinApplied.com/#sle](http://www.DaikinApplied.com/#sle).
  - 3. WaterFurnace International, Inc: [www.waterfurnace.com/#sle](http://www.waterfurnace.com/#sle).
  - 4. ClimateMaster: [www.climatemaster.com/#sle](http://www.climatemaster.com/#sle).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B Cabinet Air Discharge Configuration: As indicated on drawings.
- C Compressors: High-efficiency, hermetically sealed, dual-stage scroll type.
- D Water-to-Refrigerant Heat Exchanger: Coaxial type with factory-supplied water economizer.
- E Blower Section: Provide static or flow-controlled, variable-speed, belt-driven fan motor.
- F Filter Section: Include MERV 13 rated air filter.
- G Unit Controls: Factory-installed DDC with thermostat; see Section 25 14 00.
  - 1. BAS, SCADA, or other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.
  - 2. Control Valve: Return-installed, modulating, pressure-independent ball type; see Section 25 35 19.

## 2.5 HOSE KITS, VALVES, FITTINGS, AND ACCESORIES

- A Hoses:
  - 1. Provide hoses for units for connection to main water supply and return headers.
  - 2. Length: 2 feet.
  - 3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees Fahrenheit.
- B Automatic Balancing Valves:
  - 1. Brass body for shutoff and hydronic balancing.
- C Ball Valves:
  - 1. Brass body for shutoff and hydronic balancing.
  - 2. Provide pressure/temperature ports.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Ductwork:
  - 1. Provide as indicated on drawings; see Sections 23 31 00 and 23 33 00.
- C Source-Water:
  - 1. Connect water-side piping to respective piping source loop; see Sections 23 21 13 and 23 21 14 for related piping and hydronic specialties.
  - 2. Fit-in and install externally interconnected equipment and devices components such as pumps and heat exchanger(s) as applicable to specific selections.
  - 3. Flush and clean piping before placing in operation; take precautions to prevent introduction of debris into piping systems.
- D Coordinate installation of units with architectural, mechanical, and electrical work.
- E On water coils, provide shut-off valve on supply line and balancing valve on return line. Provide manual air vents at high points complete with stop valve.
- F Install wall-mounted thermostats, humidistats, and switch controls in electrical outlet boxes at heights to match lighting controls. Provide thermal break barrier for outdoor walls.

### 3.2 CONNECTIONS

- A Connect supply/return piping from heat pump to appropriate water source piping; see Section 23 21 13. Complete end connections with unions and shut-off valves; see Section 23 21 14.
- B Connect condensate drain pan to indirect waste connection with P-trap of adequate depth to seal against fan pressure; see Section 22 10 05.
- C Connect supply/return air ducts with flexible connectors; see Section 23 33 00.
- D Installation of piping adjacent to heat pump to allow for maintenance and service.
- E Field Install all electrical devices provided by the heat pump manufacturer not specified to be factory-installed.

### 3.3 SYSTEM STARTUP

- A Provide manufacturer's field representative to perform systems startup; see Section 23 05 93.
- B Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.
- C Adjust for proper operation within manufacturer's published tolerances.

### 3.4 FIELD QUALITY CONTROL

- A See Section 01 40 00 - Quality Requirements for additional requirements.
- B Test the heat pumps for performance compliance upon completion of the installation and energization of all electrical circuitry.
- C Operational Test: Start units to confirm unit operation and motor rotation.
- D Controls and Safety Switches: Test, adjust, and replace damaged/malfunctioning controls and equipment.
- E Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 15 00.
- F Malfunctioning Units: Remove, replace, and retest as specified above.

### 3.5 COMMISSIONING

- A See Section 01 91 13 - General Commissioning Requirements for additional requirements.

### 3.6 CLOSEOUT ACTIVITIES

- A Demonstration: Demonstrate operation of system to Owner personnel.
  - 1. Use operation and maintenance data as reference during demonstration.
  - 2. Briefly describe function, operation, and maintenance of each component.
- B Training: Train Owner's personnel on operation and maintenance of system.

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1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.

END OF SECTION 23 81 46

## SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

## PART 1 GENERAL

## 1.1 SCOPE OF WORK

- A Related work specified elsewhere:
1. Section 260574 – Overcurrent Protective Device Coordination Study
  2. Furnish and install under Division 26 – Electrical, engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor controllers – including motor controllers furnished under Divisions 21, 22 or 23, fire alarm control equipment and other electrical equipment supplied for the project. Embossed, self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:
    - a. Blue surface with white core for 120/208 volt equipment.
    - b. Black surface with white core for 480/277 volt equipment.
    - c. Bright red surface with white core for all equipment related to fire alarm system.
    - d. Dark red (burgundy) surface with white core for all equipment related to security.
    - e. Green surface with white core for all equipment related to “emergency” and “legally required standby” systems.
    - f. Orange surface with white core for all equipment related to telephone systems.
    - g. Brown surface with white core for all equipment related to data systems.
    - h. Black surface with white core for grounding terminations.
    - i. White surface with black core for all equipment related to paging systems.
    - j. Purple surface with white core for all equipment related to CCTV systems.
- B All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by phenolic tags with wire attached to conduit or outlet.
- C All outlet boxes other than those containing wiring devices, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings, where identification shall also include branch circuit designation.
- D Provide nameplates at each panelboard, switchboard, and at each termination, connection and splice point, in accordance with requirements of NEC 210.5(c) showing the color scheme used to identify the phase, neutral and grounding conductors of each voltage system in the premises. The color coding for the conductors shall be as described in Section 260519.

## 1.2 NAMEPLATE INFORMATION

- A Nameplate for panelboards and distribution switchboards shall indicate their designation, circuit designation of panelboard feeder, voltage, fed from, and feeds. Refer to equipment nameplate detail on sheet E702.
- B Nameplates for individual circuit breakers shall indicate equipment served, circuit breaker frame and size in amperes of the breaker trip, plus circuit designation of power source.
- C Nameplates for individually mounted safety switches shall indicate designation of equipment served, size in ampere of fuses, type of fuses, plus circuit designation of power source. Refer to equipment nameplate detail on sheet E702.
- D Nameplates for dry type transformers shall indicate equipment served, and circuit designation of primary side power source.
- E Nameplates for troughs or wireways shall indicate given designation, voltage, phases and number of wires plus circuit designation of trough feeder.
- F Equipment likely to be energized from two different sources at the same time shall be provided with warning nameplates clearly stating this condition.
- G Bypass switches or circuit breakers likely to be energized from the load side when the device is in the “off” position shall be provided with warning nameplates clearly indicating this possibility.

- H Provide sequence of operation of same construction as nameplates for equipment provided with bypass devices for manual transfer of loads. The sign describing the necessary steps for the transfer of loads shall be provided on the front of the equipment, in a prominent location not over 68 inches above floor. In cases where the bypass equipment is at different location provide sequence of operation signs at each location.
- I Pushbuttons, control and selector switches, and indicating lights in remote control stations shall be identified with engraved laminated plastic name plates affixed to front cover in a suitable location. The nameplate shall carry the identification of the system which is being controlled.
- J Each receptacle and light switch shall be provided with nameplate identifying circuit feeding receptacle. (For Example: "422P-16"). Affix receptacle and light switch labels on front face of outlet plate except for devices within certain public areas, like lobbies and public corridors, as coordinated and directed by the A/E during construction period, where the circuit number shall be marked with permanent ink pen marker on the interior side of the face plate.
- K Cables terminating on telecom ground bars, power ground bars and on main power ground bar shall be provided with phenolic nameplate identifying the purpose/destination of the cable. Nameplates shall be 3 inches by 1 inch with ¼ inch lettering and shall be affixed to the cable utilizing ty-wrap nylon bands.

## PART 2 PRODUCTS

### 2.1 CONSTRUCTION

- A Nameplates shall be 1/8 inch thick of phenolic material with all four face edges beveled 45 degrees, except that nameplates for wiring devices may be 1/16 inch thick of same type construction. Lettering shall be machine engraved to expose contrasting inner core color.
- B Equipment nameplates shall include ½-inch high lettering, approximately.
- C Lettering for sequence of operation signs, wiring devices and other lengthy explanatory signs, shall be not less than 1/8 inch high and clear with black letters.

## PART 3 EXECUTION

### 3.1 GENERAL

- A Nameplates shall be securely attached to equipment with self-tapping stainless steel screws, and shall identify equipment controlled, attached, etc. Letters shall be 1/2 inch high minimum. Embossed, self-adhesive plastic tape is NOT acceptable for marking equipment and shall not be used.

END OF SECTION 26 05 53

## SECTION 26 05 74 - OVERCURRENT PROTECTION DEVICE COORDINATION STUDY

## PART 1 GENERAL

## 1.1 SUMMARY

- A Provide computer based fault-current and overcurrent protective device coordination study for each power distribution system. Electrical distribution systems study from normal and alternate power source to be performed by the supplier of the electrical gear package for this project. Studies performed by independent companies not working for gear manufacturers are not acceptable. The study shall cover the following:
  - 1. Fault currents
  - 2. Overcurrent protective device coordination
  - 3. Arc flash values, flash boundaries and arc flash hazard category
- B A professional engineer, licensed by the state of North Carolina, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

## 1.2 QUALITY ASSURANCE

- A Services and work specified here shall comply with the following standards:
  - 1. NFPA 70E, IEEE 242, IEEE 399, IEEE 551, IEEE 1584.

## 1.3 COMPONENTS

- A Computer software program for plotting and diagramming time-current characteristic curves and for reporting settings and ratings of all overcurrent protective devices.
- B Provide the following for each device and device assembly:
  - 1. Arcing faults
  - 2. Arc flash values
  - 3. Arc flash boundary
  - 4. Arc flash hazard category
  - 5. Simultaneous faults
  - 6. Explicit negative sequence
  - 7. Mutual coupling in a zero sequence
  - 8. Recommended settings for the time/current trip functions of the devices

## 1.4 SUBMITTALS

- A Submit study to A/E for verification and validation, as applicable. The project electrical engineer shall review the study and shall identify additional requirements or changes that are required to complete the study to his/her satisfaction.

## 1.5 CONTRACTOR RESPONSIBILITIES

- A Contractor is responsible for providing all required information necessary to complete the study. This information includes, but is not necessarily limited to the following:
  - 1. Transformer available fault data
  - 2. One line and power riser diagrams
  - 3. Length of cables for each feeder
  - 4. Cable sizes and conduit type for each feeder
  - 5. Rating of power company transformer, impedance and primary fault available
  - 6. Configuration, rating and impedances of pad-mounted transformers and dry-type transformers.
  - 7. List of all motors being connected to the system

## 1.6 GEAR SHOP DRAWING APPROVAL

- A Approval of the contractor's proposed gear is conditional to having completed and submitted the overcurrent protective device coordination study at least two weeks prior to submitting the shop drawings. If the contractor chooses to submit the proposed gear for approval prior to the submittal of the coordination study, it shall be with the stipulation that any change in circuit breaker required to comply with the recommendations of the coordination study shall be accomplished without extra charge to the project, the owner or the A/E.

## PART 2 PRODUCTS

### 2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

- A Perform studies using the latest version of Power Tools for Windows by SKM Systems Analysts.
- B Comply with IEEE 242, IEEE 399, IEEE 551, IEEE 1584, IEEE 3002.3, and NFPA 70E.
- C Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

### 2.2 POWER SYSTEM STUDY REPORT CONTENTS

- A Executive summary of study findings.
- B Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C One-line diagram of modeled power system, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
  - 4. Motor and generator designations and kVA ratings.
  - 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
  - 6. Derating factors and environmental conditions.
  - 7. Any revisions to electrical equipment required by the study.
- D Study Input Data
  - 1. Available Power source data.
  - 2. Manufacturer, model, and interrupting rating of protective devices.
  - 3. Conductors.
  - 4. Transformer data.
- E Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- F Protective Device Evaluation:
  - 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment SCCR ratings exceed available short-circuit current at equipment installation locations.
  - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
  - 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
  - 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
  - 5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that SCCR ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- G Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. Equivalent impedance.
  2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. Calculated asymmetrical fault currents:
      - 1) Based on fault-point X/R ratio.
      - 2) Based on calculated symmetrical value multiplied by 1.6.
      - 3) Based on calculated symmetrical value multiplied by 2.7.
  3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. No AC Decrement (NACD) ratio.
    - e. Equivalent impedance.
    - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- H Protective Device Coordination Study:
1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
    - a. Phase and Ground Relays:
      - 1) Device tag.
      - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
      - 3) Recommendations on improved relaying systems, if applicable.
    - b. Circuit Breakers:
      - 1) Adjustable pickups and time delays (long time, short time, and ground).
      - 2) Adjustable time-current characteristic.
      - 3) Adjustable instantaneous pickup.
      - 4) Recommendations on improved trip systems, if applicable.
  2. Fuses: Show current rating, voltage, and class.
- I Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
  2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
  3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
  4. Plot the following listed characteristic curves, as applicable:
    - a. Power utility's overcurrent protective device.
    - b. Medium-voltage equipment overcurrent relays.

- c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
- d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
- e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
- f. Cables and conductors damage curves.
- g. Ground-fault protective devices.
- h. Motor-starting characteristics and motor damage points.
- i. Generator short-circuit decrement curve and generator damage point.
- j. The largest feeder circuit breaker in each motor-control center and panelboard.
- 5. Maintain selectivity for tripping currents caused by overloads.
- 6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
- 7. Provide adequate time margins between device characteristics such that selective operation is achieved.
- 8. Comments and recommendations for system improvements.
- J Arc-Flash Study Output Reports:
  - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
    - a. Voltage.
    - b. Calculated symmetrical fault-current magnitude and angle.
    - c. Fault-point X/R ratio.
    - d. No AC Decrement (NACD) ratio.
    - e. Equivalent impedance.
    - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- K Incident Energy and Flash Protection Boundary Calculations:
  - 1. Arcing fault magnitude.
  - 2. Protective device clearing time.
  - 3. Duration of arc.
  - 4. Arc-flash boundary.
  - 5. Restricted approach boundary.
  - 6. Limited approach boundary.
  - 7. Working distance.
  - 8. Incident energy.
  - 9. Hazard risk category.
  - 10. Recommendations for arc-flash energy reduction.

### 2.3 ARC-FLASH WARNING AND AVAILABLE FAULT CURRENT LABELS

- A Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each location indicated in the analysis unless noted otherwise.
- B Arc Flash Warning Labels shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include all information required by NFPA 70E and the following information taken directly from the arc-flash hazard analysis:
  - 1. Location designation.
  - 2. Engineering report number, revision number, and issue date.
- C Available Fault Current Labels shall have an orange header with the wording, "WARNING", and shall include the following information taken directly from the short circuit study.
  - 1. Location designation.
  - 2. Maximum available fault current.
  - 3. Calculation date.

4. Engineering report number, revision number, and issue date.
- D Labels shall be machine printed, with no field-applied markings.

### PART 3 EXECUTION

#### 3.1 GENERAL

- A Provide, as part of coordination study, a schedule of proposed settings for each service and feeder adjustable trip overcurrent protection device with the recommended setting. This schedule, once it is approved by the project electrical engineer, will be used by the contractor to set the time/current trip functions of all adjustable devices.

#### 3.2 LABELING

- A Provide label complying with requirements of NFPA-70E at each new panelboard and individual feeder protection devices stating the potential flash boundary and the arc flash hazard category and the type of clothing required to be protected from the potential hazard. Install labels on face of distribution equipment. Self-adhesive computer generated labels are acceptable. Labels exposed to weather shall be weather and sun-light proof for at least 15 years.
- B Every equipment/electrical/mechanical room where work is done under this project:
1. Shall have a personal protective equipment reference chart for arc-flash categories
  2. This reference shall be 11" x 17" and posted on wall in room
- C Every electrical panel/motor control, individual circuit breaker center/disconnect switchgear shall have an arc flash label. Each label shall have the following information:
1. Flash Hazard Boundary
  2. Cal/cm<sup>2</sup> flash hazard at 18 inches
  3. PPE-Category Appropriate
  4. Shock Hazard/voltage
  5. Glove Class
  6. Limited Approach
  7. Restricted Approach
  8. Prohibited Approach
  9. Bus: Panel Name Information

#### 3.3 COMMISSIONING

- A This contractor, and the manufacturer of the equipment and materials specified in this section, shall provide the labor, materials, equipment, services and support required by the project commissioning agent to accomplish the successful commissioning of the equipment and systems specified here.

END OF SECTION 26 05 74

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## SECTION 26 22 00 - DRY TYPE TRANSFORMERS

## PART 1 GENERAL

## 1.1 SCOPE

- A Requirements of Section 260100 shall apply.
- B Work under this Section includes, but is not necessarily limited to: Dry type Transformers, 600 volts and below.

## 1.2 APPLICABLE SPECIFICATIONS AND STANDARDS

- A Transformers shall be third party listed.
- B Equipment specified in this Section shall meet the following specifications and standards as applicable in their current edition:
- C ANSI Standards:
  - 1. C57.12.50-1981 - Requirements for ventilated dry-type distribution standards 1 to 500 KVA, single-phase and 15 to 500 KVA, three-phase with high voltage 601-34,500 volts, low voltage 120-600 volts.
  - 2. C57.12.70 - Terminal markings and connections for distribution and power transformers.
  - 3. IEEE C57.12.91 (1979) - Test code for dry-type distribution and power transformers.
  - 4. C57.96-1981 - Guide for loading dry-type distribution and power transformers.
- D NEMA Standards:
  - 1. Transformers
    - a. Dry type, Commercial Institutional and Industrial, TR27
    - b. Dry type, For General Applications, ST20
    - c. Dry type, Energy Efficient TP-1
- E Arc Flash Hazard Study:
  - 1. Design Tests: Test reports will be accepted as proof of compliance with design test requirements.
- F When providing dry-type transformers > 112.5 kVA, coordinate with SCO regarding potential downstream arc-flash implications.

## 1.3 SHOP DRAWINGS

- A Shop drawings shall be submitted conforming to the requirements stated in Division 01 - General Requirements and supplementary general conditions for the items specified here.
- B Submit the following information with shop drawings:
  - 1. Electrical ratings
  - 2. Dimensions
  - 3. Weight
  - 4. Certified sound levels
  - 5. Temperature rise versus 40 deg. C. ambient temperature.
  - 6. Insulation rating
  - 7. Rating at 80 deg. C temperature rise (Load factor is anticipated to be 35% or less and an efficiency of 98% or more to meet or exceed DOE and NEMA requirements)
  - 8. Installation details showing isolation pads, vibration isolators and method of attachment to concrete pad or to overhead structure or wall as applicable.
  - 9. Information on electrostatic shielding, as required.

## PART 2 PRODUCTS

## 2.1 WIRING TEMPERATURE RATING

- A Products specified here shall be UL listed for connection to conductors rated 75-degree C, or higher.

## 2.2 VOLTAGE RATING AND TAPS

- A Three phase transformers - 480 volts, delta primary, 120/208 volts wye secondary, 4-wire, grounded neutral. Transformers with rated output in excess of 30 KVA shall have not less than four taps 2½ percent below rated voltage, and two taps 2½ percent above rated voltage. Transformers with a rated output of 30 KVA, or less, shall have two taps 5 percent below rated voltage, minimum.
- B Single Phase Transformers - 480 volts primary, 120/240 volts, 3-wire, grounded neutral, unless otherwise noted. Taps for transformers with rated output in excess of 25 KVA shall be not less than four 2½ percent below rated voltage and two 2½ percent above rated voltage. Transformers with rated output of 25 KVA, or less, shall have two taps 5 percent below rated voltage, minimum.

## 2.3 INSULATION:

- A Except as otherwise noted on drawings, three phase transformers and single phase transformers shall have 220 degree C., Class R insulation system with 115 degree C average winding temperature rise over 40 degree C maximum ambient.

## 2.4 CONSTRUCTION

- A Transformers shall meet or exceed NEMA Standard TP-1 requirements and labeled for EPA Energy Star program.
- B Transformers shall be housed in a ventilated sheet metal enclosure, except that transformers 30 KVA, 3-phase and 25 KVA, single-phase, and smaller size may be totally enclosed.
- C Transformers KVA ratings shall be for continuous loading, with or without tap connections.
- D Core and coil assembly for dry type ventilated transformers shall be vacuum impregnated with non-hygroscopic, thermosetting varnish and baked. Insulation system shall be listed by UL. No splices shall be permitted in the coils.
- E Transformer core and coil assembly for ventilated transformers shall be mounted on isomode pad dampeners to isolate normal core vibrations from the case, foundation and conduit connections.
- F Sound level for dry type transformers shall be in accordance with NEMA Standards.

## 2.5 OVERLOAD CAPABILITY

- A Transformers shall have an overload rating in accordance with IEEE C57.96 for standard transformers and IEEE C57.110 for 'K' rated transformers.

## 2.6 ELECTRONIC NOISE ISOLATION

- A Provide, when so indicated on drawings, transformers with grounded electrostatic shielding between primary and secondary windings to provide common mode electronic noise attenuation and enhanced traverse mode noise attenuation.

## 2.7 MANUFACTURERS

- A Transformers complying with this specification and manufactured by General Electric, Eaton, Square D or Siemens will be acceptable.

## PART 3 EXECUTION

### 3.1 CONCRETE PAD

- A All floor mounted transformers rated 75 KVA and smaller shall be placed on 4-inch high housekeeping concrete pad. Transformers rated 112½ KVA and larger, installed on above-grade floors shall be mounted on 8-inch high concrete pads.

### 3.2 INSTALLATION AND CONNECTION

- A Conduit Connections:
  - 1. No conduits shall be attached directly to transformer housing.

2. Where construction permits, stub conduits up into transformer housing from beneath. Stubs shall be fitted with fiber-throated grounding bushing with suitable lug. Stubs shall be bonded together and to transformer case with ground wire of size required by N.E.C.
  3. Where connection must be made to housing, provide vibration dampening assembly consisting of:
    - a. Female hub-type liquid-tight connector.
    - b. Male hub-type liquid-tight connector.
    - c. Short length (approximately 6") liquid-tight flexible conduit.
    - d. Bonding jumper of NEC size on inside of assembly. Bond from lug to transformer case panel or switch can.
  4. Design for each medium voltage switch to be loop fed such that each switch has two independent source feeds.
  5. Pad mount switches shall be mounted on fibercrete box pads engineered and manufactured to support the particular switch.
- B Secondary neutral at each dry-type transformer shall be properly grounded as a separately derived grounded system with grounding conductor run directly to cold water pipe grounding electrode, or to nearest effectively grounded structural steel member and to the power rising grounding electrode system in accordance with requirements of section 260526. Type of wiring and installation methods shall be in accordance with manufacturer's requirements. All wiring connections to transformers shall be in raceway run as low as possible to the sides of the transformer, no field wiring shall be permitted to enter through the top of the transformer. Dry type transformers shall be installed away from walls as required by manufacturer, but not less than 6 inches off from adjacent walls for transformers 225 KVA and smaller; 12 inches off wall for larger transformers.
- C Install transformer utilizing vibration isolators as specified in Section 260140.
- D Connect transformers as recommended by transformer manufacturer to accomplish voltage output specified. Connect transformers, utilizing flexible metallic conduit in lengths of not less than 36" and not more than 72".

### 3.3 ARC FLASH HAZARD LABELING

- A Provide labeling as specified under Section 260574.

### 3.4 TRANSFORMER TESTS

- A Check for required temperature rating of connecting feeder conductors prior to connection. Provide suitable conductors. Check for proper polarity prior to energizing. Check to assure proper secondary grounding connection. Make insulation tests of windings prior to energization. After energization check secondary voltage, and change taps as required to achieve 208 volts, 240 or 120 volts as applicable plus 2 1/2% with no load. Check for excessive noise or hum. Tighten sheet metal screws, if applicable, to reduce noise.COMMISSIONING:
- B This contractor, and the manufacturer of the equipment and materials specified in this section, shall provide the labor, materials, equipment, services and support required by the project commissioning agent to accomplish the successful commissioning of the equipment and systems specified here.

END OF SECTION 26 22 00

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## SECTION 26 24 13 - SWITCHBOARDS

## PART 1 GENERAL

## 1.1 RELATED WORK SPECIFIED ELSEWHERE

- A Provide power switchboards as specified here and shown on drawings.
  - 1. Section 260553 – Electrical Identification
  - 2. Section 260574 – Overcurrent Protection Device Coordination Study

## 1.2 APPLICABLE CODES AND STANDARDS

- A Switchboard and its components shall conform to the following standards:
  - 1. UL Standards:
    - a. Dead Front Switchboard
    - b. Ground Fault Sensing and Relaying Equipment
    - c. Service Equipment
  - 2. NEMA Standards:
    - a. Circuit Breakers, Molded Case, AB1
    - b. Fuses, Cartridge, Low Voltage, FU1
    - c. Instrument - Relays, Electrical Indicating I12
    - d. Surge Arresters - LA
    - e. Switchboard - Dead-Front Distribution, PB2
  - 3. Institute of Electrical and Electronics Engineers (IEEE)
    - a. IEEE C12.7.2004 (1993) Watt-hour Meter Sockets (ANSI/IEEE)
    - b. IEEE C12.15 - (1990) Electricity Metering Solid-State Demand Registers for Electro-mechanical Watt-hour Meters
    - c. IEEE C12.16 - (1991) Electricity Metering Solid-State Electricity Meters

## 1.3 SHOP DRAWINGS

- A Submit shop drawings for switchboard in accordance with Division 01 to the Architect/Engineer for approval. Switchboard shop drawings shall include the following information:
  - 1. Front, rear, end and plan views of the switchboard with materials lists and nameplate schedule.
  - 2. Front or rear view and sectional view of switchboard showing switchboard construction, size, current rating and location of all bussing and cable furnished as part of the switchboard.
  - 3. Schematic wiring diagrams showing busses, relays and devices.
  - 4. Complete meter information including connectivity details including provisions for networking with Building Automation System (BAS) via Modbus IP.

## 1.4 QUALITY ASSURANCE

- A The contractor, through the manufacturer of the equipment specified here, shall review the use, details, and methods of installation of his product as indicated and shall disclose to the Architect any and all deviations from his recommended use and method of installation and shall also disclose to the Architect his recommendations for the use and method of installation of his product to achieve the intended purpose and result. Such disclosure shall be made within the time stipulated for submission of shop drawings. The intent of this specification is to furnish products, that when combined in a system, provide a safe, reliable and coordinated power system.

## PART 2 PRODUCTS

## 2.1 SWITCHBOARD IDENTIFICATION

- A Nameplate: Provide switchboard phenolic nameplate indicating switchboard designation, voltage and phases.
- B Provide nameplate on service device cubicle stating: "Service device one of xxxxx".

- C Device Nameplates: Provide individual phenolic nameplates for each feeder circuit breaker in accordance with schedule shown on drawings. Nameplate shall indicate designation of equipment fed and its power rating in HP or KW, as applicable.

## 2.2 POSTING OF POWER DRAWINGS

- A Post on front of each switchboard, framed under glass, 1/2 scale photostat of 'record' drawing of power riser diagram for all feeders, through the last panel, served from the switchboard.

## 2.3 WIRING TEMPERATURE RATING

- A All products specified here shall be UL listed for connection to conductors rated 75-degree C, or higher.

## 2.4 MIMIC BUS

- A Provide mimic bus on front panel of switchboard to depict actual bus arrangement inside cubicles.

## 2.5 SERVICE LABEL

- A Switchboard Equipment shall be UL labeled as "Suitable for Use as Service Entrance Equipment".

## 2.6 BUSSING

- A All bussing shall be silver-plated copper.  
B Switchboards shall have a 100% neutral bus of the same material as the main bus. A copper ground bus shall be provided in each section.

## 2.7 METERING

- A Provide E5X Series electronic type meter for service switchboard, in a separate compartment, to meter incoming service power. Meter shall be networked with the Building Automation System (BAS) to allow for remote monitoring per ECSU requirements.

- B The main meter shall be installed by the switchgear manufacturer on front of switchboard. All control power, CT PT and wiring shall be factory installed and harnessed within the switchgear lineup. Terminal blocks shall be provided and the manufacturer's drawings must clearly identify the interconnection requirements, including wire type, to be used for external connections. The electronic meter shall accept inputs from industry standard instrument transformers (120 VAC secondary PTs and 5A secondary CTs). All setup parameters required by the electronic meter shall be stored in nonvolatile memory (no battery backup) and retained in the event of a control power interruption. The electronic meter shall also maintain, in nonvolatile memory, a maximum and minimum value for each of the instantaneous values reported, as well as the time and date of the highest peak for all of the peak demand readings. The meter should indicate clearance values based on 15-minute integrated demand. Meter shall be provided with means to reset. The electronic meter shall be equipped with an integral LED display to provide access to metered quantities. The following instantaneous readings shall be reported by the main service electronic meter both locally and remotely through the BAS:

1. Energy kWh, kVARH, kVAH
2. Real power, KW, per phase and total
3. Reactive power, kVAR, total
4. Apparent power, VA, total
5. Power factor, per phase and total
6. Max power, kW max
7. Voltage, V, per phase, neutral and average
8. Current, A, phase, average and neutral
9. Demand, kW, kVAR, kVA, A
10. Frequency
11. THD, voltage and current date/time stamping
12. KYZ output

- C The Power Meter shall be able to perform Harmonic Analysis with trigger trace memory, waveform capture, event recorder and data logger.
- D The Power Meter shall have built-in data communications to allow Multi-point communication to multiple computer workstations, programmable controllers, and other host devices, at a minimum data rate of 9600 baud. The Power Meter shall be able to communicate with the Owners Tridium Niagara Software through the Network Area Controller, NAC, Panel for building management and/or other monitoring functions. The Power Meter shall be compatible with Modbus IP Communications.
- E The Power Meter shall include shorting blocks.
- F The Power Meter shall be capable of recording a minimum of 7 events.

## 2.8 NETWORKING & REMOTE MONITORING

- A The switchboard main power meter shall have protocol capabilities, including interface cards, gateways or converters, as required and communication ports for direct network integration with the Building Automation System (BAS).
- B The communication protocol shall be any of Modbus IP.
- C If the equipment specified here does not directly support the BAS compatible interface, the equipment manufacturer shall supply as part of the equipment package, a gateway or converter that will act as a protocol translator to convert the native equipment protocol to compatible slave protocol. Coordinate with ECSU prior to purchasing the power equipment.
- D Any additional wiring or programming associated with configuring any gateways or converters is the responsibility of this section equipment manufacturer.
- E Meters shall include necessary KYZ pulse initiation hardware, as applicable, to integrate with BAS.
- F Installation:
  - 1. As part of the equipment manufacturer's installation and commissioning services, a factory authorized field engineer familiar with the communication interface will be present to assist the customer or the customer's designated representative in verifying that the communication interface to the building automation system is functional.
  - 2. Any re-cabling, terminations, or re-programming required to make the interface 100% functional will be at the expense of the equipment manufacturer.
  - 3. As part of the field installation, the equipment manufacturer's field engineer will provide a backup of any settings that are programmed for the communication interface. The backup will be stored locally with the equipment.
  - 4. Any programming to make any dry contacts functional will be provided by the equipment manufacturer.
  - 5. The equipment manufacturer will provide a factory authorized field engineer to assist the customer or the customer's designated representative in verifying that the alarms and statuses are functioning properly.
- G Submittals:
  - 1. As part of the equipment drawing submittals, the equipment manufacturer will provide a drawing that clearly indicates the termination points for BAS interface communications. If the manufacturer requires a gateway or converter, the drawings will also include drawing(s) that clearly identify dimensions, mounting requirements, power requirements and interconnections for the converters or gateway.
  - 2. The equipment manufacturer will provide to the customer detailed BAS interface configuration documentation. At a minimum, the document shall include: supported function codes, slave address, Communications settings, and a register memory map.
- H Communication Cabling and Protocol:
  - 1. The cabling will be shielded twisted suitable for use in data communications as required by interface with BAS.

## 2.9 MANUFACTURERS

- A Eaton

- B General Electric
- C Square D
- D Siemens

## 2.10 OVERCURRENT PROTECTION DEVICES

- A Circuit breakers shall not be series rated. Equipment fault ratings shall not be based on overcurrent device series rating.
- B Main device shall be a circuit breaker, with the following characteristics:
  - 1. Solid state trip with long-time, short-time, adjustable instantaneous and ground fault adjustment.
  - 2. Inverted position for incoming service from below, unless otherwise noted.
  - 3. Ground Fault protection.
- C Main Service overcurrent protective device shall be provided with ground fault protection. Ground fault sensing shall be based upon the unbalanced current flow in the applicable conductors, including the necessary relaying to detect the zero sequence component of the fault. An indicating light shall be provided to indicate a ground fault situation and tripping breaker. Main device shall have auxiliary contacts to indicate tripping.
- D Feeder devices shall be UL listed plug-in or bolt-on type circuit breakers.
- E Each circuit breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate, as well as exercise the circuit breaker operating mechanisms.
- F Feeder circuit breakers rated 200 amperes and higher shall be molded case or plastic encased circuit breakers with solid state trip units. Interrupting ratings shall be 65,000 amperes at 480 VAC, unless otherwise noted on drawings. All circuit breakers shall be UL listed and meet NEMA Standard AB1-1975 and Federal Specification W-C-375B/GEN when applicable. All circuit breakers rated less than 600 amperes shall have thermal/magnetic trips.
- G Breakers shall be calibrated for operation in an ambient temperature of 40°C. Each solid state trip circuit breaker shall have trip indication by handle position and shall be trip-free. The ampere rating of the circuit breaker shall be determined by the interchangeable rating plug. Solid state trip circuit breakers shall have reliable electronic components to measure and time the output from internal current sensors and initiate automatic tripping action. A button shall be provided on the cover for mechanically tripping the circuit breaker. Solid state trip circuit breakers shall be constructed to accommodate the supply connections at either end of the circuit breaker. Circuit breakers shall be suitable for mounting and operating in any position.
- H Solid state trip circuit breakers shall include the following tripping features:
  - 1. An ampere setting which is adjustable .7, .8, .9, 1.0 times the rating plug amperes.
  - 2. A short time pickup which is adjustable to (2, 4, 6 or 8) (2, 4, 5 or 6) times the ampere setting and includes a short time delay ramp function.
  - 3. An instantaneous pickup which is adjustable up to 12 times or higher the ampere setting.
- I A portable test set shall be available to verify operation of the solid state circuit breaker without requiring disassembly of the breaker. A UL listed method for field testing the ground fault protection shall be available.
- J Solid state trip circuit breakers with frames rated at 1000A and higher shall be provided with integral equipment ground fault protection for grounded neutral systems. In addition, provide ground fault protection to other circuit breaker, as indicated on drawings, regardless of rating as indicated on switchboard schedule. These circuit breakers shall be provided with the following features:
  - 1. A ground fault pickup setting adjustable from 30% to 80% of rating
  - 2. A ground fault delay setting which adjusts to .1, .2, .3 and .5 seconds
  - 3. A neutral current transformer for use on four wire systems
  - 4. A built-in ground fault trip indicator
- K Molded Case Circuit Breakers (500A and below):
  - 1. NEMA AB 1 FS W-C-375; Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

- L Circuit breakers larger than 1200A shall be draw-out type breakers.
- M Provide electrical phase protection at main to prevent phasing of service to the building.

## 2.11 SWITCHBOARD CONSTRUCTION

### A Main Service Switchboard:

1. Switchboard shall be totally enclosed, self-supporting dead front distribution type with one or more vertical sections in which main overcurrent protective device is individually mounted or group mounted. Feeder devices shall be group mounted.
2. Access to devices shall be from front and rear.
3. The top and side covers shall be removable with covers bolted to the frame.
4. Busses including neutral and ground busbars, switching devices and connections shall be silver-plated copper of sufficient size to limit the temperature rise to NEMA standards.
5. All busses shall be braced for short circuit stresses of not less than the fault values scheduled on drawings. All bus work shall be accessible for inspection and maintenance purposes. Line busses and load terminals shall be so located that it will not be necessary to reach across or beyond a live bus to make load connections. Separate neutral and equipment ground busses sized at 100 percent and 12 ½ percent of phase busses respectively shall be provided for the full length of the switchboard. Busses shall have the lugs necessary to terminate full or oversized neutrals and grounding conductors for all present and future feeders (spare and spaces) scheduled. Connections other than on load side of distribution switches shall be by means of bus and not cable.
6. Switchboard enclosure shall be NEMA standard, type as indicated on drawings. The switchboard shall be finished with a medium light gray standard with manufacturer for exterior and interior surfaces and all sheet metal parts shall be rust-proofed after fabrication and prior to painting.
7. Switchboard current ratings shall be as indicated in switchboard schedule on drawings.
8. Switchboard sections shall be factory braced to allow section to be transported on it's sides and/or back.

## PART 3 EXECUTION

### 3.1 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT

- A The equipment manufacturer shall provide an overcurrent protection device coordination/arc fault protection study for the entire electrical system as specified in Section 260574. In addition the equipment manufacturer shall provide testing, setting and certification of the switchboard overcurrent protection devices, trip functions upon the completion of the installation of the system. The work shall be done by qualified factory technicians working under the direct supervision of the electrical contractor. Setting of trip functions on circuit breakers, shall be done by the factory technicians in accordance with the setting values that are part of the device coordination study as approved by the Project Engineer. Any component found not working properly shall be replaced at no extra cost to the Owner. The procedures shall include the setting of the pick-up amperes level and time-delay for each trip function.
- B Upon completion of the testing and setting procedure, a written certification shall be submitted to the Architect/Engineer showing tabulated results and stating that the system has been installed and functions in accordance with the applicable specifications, standards and codes.
- C The flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements and flash boundaries, hazard category and protective gear requirements shall be posted on the equipment. Refer to section 260574.

### 3.2 SWITCHBOARD TESTS

- A Carefully examine and manually operate series overload trips auxiliary devices and interlocks, and direct overload settings. Inspect all bus assemblies and live parts for adequate and ground clearance. Make insulation tests from bus to ground and between phases, before energizing. Remove construction dirt and debris before energizing system. After energizing, check secondary voltage. If voltage is below or above rated voltage, request from power company to change utility transformer taps to provide rated voltage at the switchboard busses.

### 3.3 INSTALLATION

- A Install switchboard in locations shown on drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1, on nominal 4-inch concrete housekeeping pad, anchored to the pad in accordance with manufacturer's instructions and Section 260529.
- B Tighten accessible bus connections and mechanical fasteners after placing switchboard.

### 3.4 FIELD QUALITY CONTROL

- A Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- B Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms.
- C Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

### 3.5 ADJUSTING AND CLEANING

- A Adjust all operating mechanisms for free mechanical movement.
- B Touch up scratched or marred surfaces to match original finish.
- C Adjust trip and time delay settings of all circuit breakers as instructed by the Architect/Engineer. Work shall be done by equipment manufacturer's technicians.

### 3.6 CIRCUIT BREAKER TESTS

- A Perform the following tests on each of the main service circuit breakers and distribution breakers in the service switchboard. Testing shall be performed by a qualified factory technician at the job site. All readings shall be tabulated:
  - 1. Phase tripping tolerance (within 20% of UL requirements.)
  - 2. Trip time (per phase) in seconds (delay).
  - 3. Instantaneous trip (amps) per phase (pickup).
  - 4. Insulation resistance (megaohms) at 100-volts (phase to phase, and line to load).
  - 5. Set final trip functions to match the engineers approved overcurrent protection device coordination and arc flash study.
  - 6. The ground fault protection on circuit breakers shall be performance tested in the field, in accordance with NEC, and properly calibrated and set in accordance with the coordination study.
  - 7. The settings for the breakers shall be listed on the record drawing.
  - 8. Arc Energy Reduction performance testing per NEC.
- B All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
- C All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

### 3.7 METERS, TESTING, CERTIFICATION AND LABELING

- A Meter shall be installed and connected in accordance with IEEE CV12.7 standard and as directed by the manufacturer.
- B Installation shall be inspected, tested and calibrated by a qualified representative of the manufacturer.

- C Wiring: Use cables in conduit suitable for wet locations, as applicable, as recommended by manufacturer. Provide all required voltage leads, CT leads, and network wiring, as required.
- D Inspection: Examine for broken parts, shipping damage, and tightness of connections. Verify that meter type, scales and connections are in accordance with approved shop drawings.
- E Electrical Tests: Determine accuracy of meter. Calibrate watt-hour meters as recommended by manufacturer. Verify that correct multiplier has been placed on face of meter, where applicable. Verify that meter is properly integrated with BAS, as applicable.
- F Test Certification: Submit certification of successful accomplishment of test along with operation instructions for the power meters. The certification shall list each power meter in the project, its location and the feeder or equipment being monitored by meter. State for each meter that the meter is operational as intended. The certification shall include date when the meter was tested and the name of the technician that performed the test. The document shall be certified, sealed and signed by the responsible person who did the test.
- G Posting Of Meter Reading and Resetting Instructions: After all tests have been successfully accomplished, post adjacent to each type of power meter specific, step-by-step instructions for its reading and resetting. The instructions shall be custom made for the meter and shall not be a copy of the manufacturer's manual. Include among others:
  - 1. Amps and volts per phase, both average and neutral
  - 2. Overall KW and KVA
  - 3. Highest demand KW and KVA
  - 4. KWH
  - 5. Power factor and KVAR, if applicable
  - 6. THD values, if applicable
  - 7. How to scroll through values to find specific function
  - 8. How to reset demand and KWH values
- H Instructions shall be typed and shall be in laminated form or as a phenolic nameplate and shall be posted on the switchboard.
- I If all meters in switchboard are alike, a single set of instructions shall suffice.

### 3.8 OWNER'S PERSONNEL TRAINING

- A Provide a training session for the Owner's personnel conducted by a representative of the switchboard manufacturer. Training shall cover the following topics:
  - 1. Setting of Circuit Breaker Trips
  - 2. Operation and Reading of Metering Equipment
  - 3. Re-setting of Metering Equipment
  - 4. Monitoring System Setup and Adjustment
  - 5. Maintenance Requirements and Procedures
- B Verify also at this time the integration of each power meter with BAS.

### 3.9 COMMISSIONING

- A This contractor, and the manufacturer of the equipment and materials specified in this section, shall provide the labor, materials, equipment, services and support required by the project commissioning agent to accomplish the successful commissioning of the equipment and systems specified here.

END OF SECTION 26 24 13

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## SECTION 26 24 16 - PANELBOARDS

## PART 1 GENERAL

## 1.1 SCOPE OF WORK

- A This section covers construction of all lighting, power, distribution panels, and auxiliary panels as shown on the drawings.
- B Requirements of Section 260100 shall apply.
- C Refer to panelboard schedule and power riser diagram on drawings for specific requirements of each panel.
- D All panelboards shall be UL listed and labeled.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Section 260553 – Electrical Identification
- B Section 260574 – Overcurrent Protective Device Coordination Study
- C Section 262413 – Switchboard

## 1.3 APPLICABLE STANDARDS

- A UL 50 Safety enclosures for electrical equipment
- B UL 67 Panelboards
- C UL 489 Molded-case circuit breakers, molded-case switches, and circuit breaker enclosures
- D UL 869A Service equipment
- E UL 943 Ground-fault circuit interrupters

## 1.4 SUBMITTALS

- A Detail shop drawings of panelboards provided under this Section shall be submitted for Architect/Engineer approval. Shop drawings shall show bus and circuit breaker arrangement as shown on Contract Drawings.

## 1.5 QUALITY ASSURANCE

- A The contractor, through the manufacturer of the equipment specified here, shall review the use, details, and methods of installation of his product as indicated and shall disclose to the Architect any and all deviations from this recommended use and method of installation and shall also disclose to the Architect his recommendations for the use and method of installation of his product to achieve the intended purpose and result. Such disclosure shall be made within the time stipulated for submission of shop drawings.

## PART 2 PRODUCTS

## 2.1 MANUFACTURER

- A All panelboards shall be the products of one manufacturer unless otherwise noted and shall be the standard products of Eaton, Square D, or General Electric.
- B Equipment indicated and in the specification is based on the standard products of one manufacturer. The Contractor shall be responsible for the space requirements of other approved manufacturers.

## 2.2 WIRING TEMPERATURE RATING

- A Products specified here, including all feeder and branch circuit protective devices shall be UL listed for connection to 75°C conductors, or higher.

## 2.3 BRANCH CIRCUIT PANELBOARDS

- A Maximum quantity of circuit breakers in a branch circuit panelboard shall not exceed 42 poles.

- B Branch circuit panelboards shall be of the dead-front safety type. The panelboard shall be provided with lugs only in the mains unless main circuit breaker or fuse switches are indicated on the drawings. Panelboard shall be provided with the size and number of single, double or triple pole branch circuits as indicated on the drawings, except when fused switches are specified for distribution type panelboards. Circuit breakers shall be of the automatic thermal magnetic type, quick-make and quick-break for manual and automatic operation. All multi-pole breakers shall be common trip. Each panelboard shall be provided with a copper grounding terminal busbar bonded to the cabinet or panelboard frame. Isolated ground bus shall additionally be provided when scheduled on drawings.
- C All circuit breakers shall be bolt-on, calibrated for 104 degrees Fahrenheit, or be ambient compensating. Circuit breakers shall have UL interruption ratings as indicated on the drawings. Series rating for short circuit rating of panelboards and circuit breakers is not acceptable. Breakers used to switch lighting loads shall be labeled accordingly.
- D Each panel, as a complete unit, shall have a short circuit current carrying rating equal to or greater than the integrated equipment rating shown on the panel schedule or on the plans. This rating shall be established by testing with the overcurrent devices mounted in the panel. Method of testing shall be per UL standard 67. Panels shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed and bear the UL label.
- E Provide, when scheduled, ground-fault protection type branch circuit breakers (GFI) rated to trip when current leakage to ground exceeds 5 milliamperes.
- F Cabinets for branch circuit panelboards shall be minimum 20 inches wide, except otherwise noted for oversized gutters, and shall be provided with not less than 4-inch wiring gutters at the sides, top and bottom. Flush cabinets shall be provided with screw trims having adjustable trim clamps. Trims shall be fitted with hinged doors (along one side of the enclosure – door-in-door type) having combination lock and latch. All locks shall be keyed alike. One or more directory holders protected with clear plastic and metal frame as required for rendering entire directory visible shall be mounted on the inside of each door. A neatly typed directory properly identifying each circuit shall be mounted under plastic on inside of each door. Each circuit shall be identified by the type of load and the location of the load; I.E.: “Lighting Rooms 125, 127 and 128”, which is not necessarily what is shown on the contract drawings.
- G Unless otherwise specifically noted all circuit breakers in a panelboard shall have been built by the same manufacturer who built the panelboard.
- H Panelboard buswork including phase, neutral and grounding busbars shall be copper. Neutral buses shall not be less than same rating of the panel, but shall be increased in size when so scheduled on drawings. Neutral and ground buses shall have sufficient wiring terminating positions to satisfy oversized feeder neutrals and dedicate branch circuit neutral conductors for each 277 or 120 volt circuits and grounding requirements for present and future breakers. Provide additional isolated ground equipment grounding bus when so called for in the panelboard.
- I A running directory shall be maintained during construction.
- J All exterior and interior steel surfaces of panelboard trims shall be finished with gray ANSI-61 paint over a rust-inhibiting phosphatized primer.
- K Flush mounted panelboards shall have a maximum depth of six inches.
- L Panelboards used as service equipment shall be UL labeled as “Suitable for use as Service Equipment.”
- M Panelboards shall be provided with mains as scheduled on drawings. If mains are not shown provide main circuit breaker matching the ampere rating of the panelboard, but in no case less than 125 ampere rating.
- N Additional requirements for branch circuit panels:
1. A flush latch and tumbler type lock, so panel door may be held closed without being locked. All such locks shall be keyed alike. Furnish two keys with each lock, or a total of 10 keys for the project.

2. Cover shall have inside support studs to rest on lower edge of can while being fastened. For flush mounted panelboards, cover fastener hardware shall be concealed behind the hinged door.
  3. Interior trim shall fit neatly between interior assembly and cover leaving no gaps between the two. Where two section panels are specified, both panel trims shall have the same weight.
  4. Breakers in branch circuit panels shall be physically arranged in locations shown in panel schedules on the drawings. They shall be connected to the phases as shown. No Exceptions are Allowed.
  5. Feed-through or sub-fed lugs within panels are not permitted, except upon consultation with State Construction Office (SCO), for interconnecting multi-section panels. When sub-feed or feed-thru lugs are incorporated, the multi-section panelboard must be protected by a single main overcurrent device either in the panelboard or immediately upstream.
  6. "Load Centers" are not acceptable except in certain instances approved by the SCO.
  7. Circuit breakers shall not be series rated. Equipment fault ratings shall not be based on overcurrent device series ratings.
  8. On large buildings (20,000 sf and larger), the electrical panels that feed luminaires shall not feed receptacles and electrical panels that feed receptacles shall not feed general lighting luminaires.
  9. Provide permanent tags attached to the branch circuit wire identifying the associated circuit breaker position.
  10. Minimum interrupting capacity rating of any panel assembly shall be 10,000 amps. See prepared Device Coordination Study for actual recommended rating.
  11. Branch circuit breakers shall be bolt-on, thermal-magnetic, molded case. Single pole, 15 and 20 ampere breakers intended to switch fluorescent lighting loads on a regular basis shall carry the SWD marking.
- O Distribution Type Panelboards:
1. Other than for physical dimensions and type of circuit breakers, all the requirements stated for branch circuit panelboards apply to distribution type panelboards.
  2. Circuit breakers in distribution panelboards shall be bolt-on molded case type through 500A size.
  3. Circuit breakers covered under this section shall be installed in distribution panels. They shall be one, two or three pole molded case circuit breakers rated 600 VAC as specified on the drawings. Breakers shall be high interrupting construction. All breakers shall be UL and CSA listed, IEC 157-1 rated, meet NEMA standard AB1-1986 and Federal Specification W-C-375B/GEN, when applicable.
  4. Breakers shall be calibrated for operation in 40 deg.C ambient temperature and contain individual thermal and magnetic trip elements in each pole. Breakers with frame sizes ranging from 125 to 800 amperes shall have variable magnetic trip elements which are set by a single adjustment (to assure uniform tripping characteristics in each pole). Breakers rated 600 amperes and higher shall be solid state type with trip functions as specified for similar size breakers in Section 262413 – Switchboards. The breaker shall have reverse connection capability and be suitable for mounting and operating in any position.
  5. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper conductors only, rated 167 degrees Fahrenheit. Breakers shall be UL listed for installation of mechanical type lugs.
  6. Distribution Board Breakers shall be one, two, or three pole molded case circuit breakers rated 600VAC. Breakers shall be high interrupting construction.
  7. Breakers with frame sizes greater than 100 amperes shall have variable magnetic trip elements which are set by a single adjustment (to assure uniform tripping characteristics in each pole). A push-to-trip button shall be provided on the cover for mechanically tripping the breaker. The breaker shall have reverse connection capability and be suitable for mounting and operating in any position.

8. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper conductors only, rated 167 degrees Fahrenheit. Breakers shall be UL listed for installation of mechanical type lugs.
9. Additional Requirements:
  - a. For branch circuit panels, directory cards shall be neatly typed to indicate load served by each breaker or fuse. Directory cards shall indicate circuits in a manner analogous to the physical circuit breaker arrangement (i.e. odd numbered circuits in one column, even numbered circuits in another). Mount cards behind heavy plastic shields in metal frame. Mark spares and spaces in erasable pencil only. Cards shall be a minimum of three inches wide.
  - b. Next to each breaker within distribution panels, attach a label indicating load served. Wording shall be as required to specifically indicate the loads and location of loads fed by each circuit breaker and meet requirements of NEC.
  - c. Top or bottom gutter space shall be increased six inches where feeder loops through panel. End plates shall be galvanized Code gauge (minimum) and shall be supplied without knockouts.
  - d. Covers shall be constructed of high grade flat sheet steel of Code gauge minimum with the following:
  - e. Door flush with face and closed against a full inside trim stop. Hinges shall be inside type.
  - f. A combination flush latch and Yale, Corbin or equivalent, tumbler-type lock, so panel door may be held closed without being locked. All such locks on same job shall be keyed alike. Plastic lock type trims are not acceptable.
  - g. Finish of manufacturer's standard color of top-grade enamel over a phosphatized or other approved rust inhibitor treatment and prime coat.
  - h. Four or more cover fasteners of a type which will permit mounting plumb on box. Cover shall also have inside support studs to rest on lower edge of can while being fastened.
  - i. Distribution and lighting type panelboards shall be furnished with covers hinged to backbox. Hinge shall be continuous "piano" hinge type permanently spot welded to the panelboard cover. Hinge shall in turn bolt securely to the backbox.
  - j. For lighting panels, breakers shall be "Quicklag" type bolted to the supply bus. Plug-in types are not acceptable.
  - k. Supply lugs shall be installed on busses and neutral bar so they may be readily and securely tightened from the front with panel in place and wired. A suitable arrangement shall limit their movement out of plumb. It shall not be possible to move the lugs so that metal parts between phases are closer than 3/8".

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A Front edges of all flush mounted panel housing shall be exactly flush with the finished wall.
- B All equipment, either surface or flush mounted, shall be plumb and level.
- C All openings in boxes, cabinets, or gutters shall be cut or sawed with tools made for that purpose. Burning of openings is absolutely unacceptable.
- D All unused openings shall be closed.
- E Only one solid wire is allowable under a screw. Provide an approved lug for connecting stranded wire or more than one solid conductor.

### 3.2 MOUNTING HEIGHT

- A Panelboards shall be mounted so that the operating handle of the top unit does not exceed 6'-6". Panels mounted adjacent to each other shall have the top trim level.

### 3.3 SURFACE MOUNTED

- A Exterior Walls: Panelboards on exterior walls shall be mounted on UNISTRUT or similar type system, to provide minimum 3/4" air space between panel and wall.
- B Interior Walls: Panelboards shall be secured to wall in four locations using ACKERMAN-JOHNSON or similar fastening devices. Refer to specifications on supporting devices for additional requirements.
- C Panelboard trims shall be flush with enclosure.
- D All panelboard trims shall meet flush with wall when panel is flush mounted.

### 3.4 NAMEPLATE

- A Provide nameplate in accordance with Section 260553.

### 3.5 LABELING

- A Identify branch circuit conductor with tags, per Division 26 and as required to comply with NEC.
- B Labeling shall be as follows:
  - 1. Label all equipment in conformance with documents.
  - 2. For branch circuit panels, directory cards shall be neatly typed to indicate load served by each breaker or fuse. Directory cards shall indicate circuits in a manner analogous to the physical circuit breaker arrangement (i.e. odd numbered circuits in one column, even numbered circuits in another). Mount cards behind heavy plastic. Panelboard directory card shall be neatly typed with circuits assigned as shown on schedules. Space typing on card so all is visible when inserted into frame. Use room names and numbers as provided by Owner, not those shown on schedule. Names and numbers on schedule relate to plans only for construction. Indicate spare breakers in pencil (not typed) so that owner can erase and change as necessary in the future.
  - 3. Next to each breaker within distribution panels, attach a label indicating load served. Wording shall be as shown on its diagram or schedule on the drawings. Labeling shall also be attached to separately-mounted breakers, switches, transformers, wiring gutters and controllers of all types.
  - 4. Centered above door on panel cover attach a label indicating panel designation-for example, "Panel A;-voltage- 120/208 VOLTS": and from where served - "FED FROM PANEL MDP".
  - 5. Interrupting capacities shall be as indicated on the panel schedules. All ratings are for fully rated panels and breakers; series ratings are not acceptable.

### 3.6 SPARE CONDUITS

- A Provide for each flush-mounted panelboard six (6) spare 3/4 inch conduits from panel to above accessible ceiling of area served (normally a lab) for future extension cap conduits. Seal ends of conduit with caps or with U.L. approved fire stopping material.

### 3.7 ADJUSTING AND CLEANING

- A Adjust all operating mechanisms for free mechanical movement.
- B Touch up scratched or marred surfaces to match original finish.
- C Adjust trip and time delay settings of all adjustable circuit breaker trips in accordance with approved overcurrent protection coordination study as required by Section 260574. Work shall be done by equipment manufacturer's technicians. Adjusting and setting shall be performed by equipment manufacturer's qualified technicians

### 3.8 CIRCUIT BREAKER TESTS

- A Perform the following tests on each of the main service circuit breakers and distribution breakers in the distribution panelboards rated 1000A or higher. Testing shall be performed by a qualified factory technician at the job site. All readings shall be tabulated:
  - 1. Phase tripping tolerance (within 20% of UL requirements.)
  - 2. Trip time (per phase) in seconds (delay).
  - 3. Instantaneous trip (amps) per phase (pickup).

4. Insulation resistance (megaohms) at 100-volts (phase to phase, and line to load).
5. Set final trip functions to match the engineers approved overcurrent protection device coordination and arc flash study.
6. The ground fault protection on circuit breakers shall be performance tested in the field, in accordance with NEC, and properly calibrated and set in accordance with the coordination study.
7. The settings for the breakers shall be listed on the record drawing.
8. Arc Energy Reduction performance testing per NEC.

3.9 FLASH PROTECTION BOUNDARY

- A The flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 NFPA 70E and NEC 110-16 requirements. Refer to Section 260574.

END OF SECTION 26 24 16

## SECTION 26 32 00 - PACKAGE ENGINE GENERATOR SET SYSTEM

## PART 1 GENERAL

## 1.1 SCOPE OF WORK

- A Package Engine Generator Set System shall be installed complete in every respect so that upon failure of the normal source of power, a separate local source of power shall automatically be provided to this building emergency power distribution systems within 10 seconds of the failure of the normal source.
- B The Contractor shall install and connect a diesel engine driven generator set, complete as hereinafter specified. The installation shall include exhaust silencer, exhaust pipe, electrical starting system, automatic transfer switches, outdoor weather – protective walk-in enclosure, exhaust, fuel tank and all appurtenances needed for a complete installation as specified herein and as shown on the drawings.
- C Refer to electrical drawings for additional requirements.
- D The equipment specified here shall be anchored, inspected, tested, and certified to resist equivalent static forces and displacements for the stated seismic design category in accordance with requirements of the NCSBC.
- E In addition, electrical equipment specified here shall have an Importance factor (Ip) greater than 1.0 and shall be designed and constructed to meet force and displacement requirements specified under Chapter 16 of the NCSBC. Refer to section 26 05 48 for additional requirements.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Section 26 05 33 – Electrical Identification
- B Section 26 05 74 – Overcurrent Protective Device Coordination Study
- C Section 26 36 00 – Transfer Switches

## 1.3 REFERENCES AND STANDARDS

- A The generator set covered by these specifications shall be designed, tested, rated, assembled, installed and labeled when application in strict accordance with all applicable standards below:
  - 1. CSA C22.2 No14
  - 2. CSA 282
  - 3. CSA 100
  - 4. EN61000-6
  - 5. EN55011
  - 6. FCC Part 15 Sub-part B
  - 7. ISO8528
  - 8. IEC61000
  - 9. UL508
  - 10. UL2200
  - 11. UL142
  - 12. Designed to allow for installed compliance to NFPA 30, NFPA 37, 70, NFPA 76A, NFPA 110 and NEC 700, 701 and 702.
  - 13. NFPA 70 – 2020 National Electrical Code
  - 14. New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines (40 CFR 60 Subpart III)
  - 15. National Emission standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (40 CFR 63 Subpart ZZZZ) – current proposed, as applicable.
  - 16. Mecklenburg County Air Pollution Control Ordinance (MCAPCO) Regulations, as applicable.

#### 1.4 REQUIREMENTS, CODES AND REGULATIONS

- A The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a Manufacturer who has 25 years of experience building this type of equipment. Manufacturer shall be ISO9001 certified.

#### 1.5 MANUFACTURERS

- A Equipment specified here is based on Caterpillar products. Equivalent products from Cummins, Kohler, Generac, or Detroit Diesel are acceptable, subject to the conditions stipulated and approval by owner.
- B Proposed deviations from the specifications shall be treated as follows:
1. Substitution Time Requirement: Any proposed deviation or requests for substitutions for other than Caterpillar, Cummins, Kohler, or Detroit Diesel shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data shall accompany each request and authorized acceptance shall be addenda only.

#### 1.6 SUBMITTALS

- A Engine-generator submittals shall include the following information:
1. Factory published specification sheet.
  2. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, control panel, enclosure, etc.
  3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
  4. As part of the equipment drawing submittals, the manufacturer shall provide a drawing(s) that clearly indicates the details for integration with the Facility Management and Control System (FMCS).
  5. Provide the MAC address to the Owner as soon as it is available for assignment of IP address for integration.
  6. If the manufacturer requires a gateway or converter, drawings shall be included that clearly identify dimensions, mounting requirements, power requirements and interconnections for the converters or gateway.
  7. Weights of all equipment.
  8. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems.
  9. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, control panel, and remote alarm indications.
  10. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
  11. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
  12. Generator resistances, reactances and time constants.
  13. Generator locked rotor motor starting curves.
  14. Manufacturer's and dealer's written warranty.

#### 1.7 SYSTEM RESPONSIBILITY

- A Generator Set Distributor:
1. The completed engine generator set shall be supplied by the Manufacturer's authorized distributor only.
  2. Requirements, Codes and Regulations: The equipment installed shall meet the requirements of NEC and all-applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory trained service personnel.
- B Automatic Transfer Switch:

1. The automatic transfer switch specified in Section 26 32 14 shall be supplied by the generator set manufacturer to establish and maintain a single source of system responsibility and coordination.

C Warranty:

1. Five (5) Year Continuous Power (ISO 8528-1: COP) Generator Set Warranty
2. The manufacturer's standard warranty shall in no event be for a period of less than five (5) years from date of final inspection and acceptance of the system and shall include repair parts, labor, travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during repair. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

D Parts and Service Qualifications:

1. Service Facility: The engine-generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.
2. Service Personnel: The dealer shall maintain qualified factory trained service personnel.

## 1.8 SERVICE MANUALS AND PARTS BOOKS

A The system manufacturer's authorized local dealer shall furnish four copies each of the manuals and books listed below for each unit under this contract:

1. Operating instructions with description and illustration of all switchgear controls and indicators; and engine and generator controls and indicators.
2. Parts books that illustrate and list all assemblies, subassemblies, and components, except standard fastening hardware (nuts, bolts, washers, etc.).
3. Preventive maintenance instructions on the complete system that cover daily, weekly, monthly, biannual, and annual maintenance requirements and include a complete lubrication chart.
4. Routine test procedures for all electronic and electrical circuits and for the main ac generator.
5. Troubleshooting chart covering the complete generator set showing description of trouble, probable cause, and suggested remedy.
6. Recommended spare parts list showing all consumables anticipated being required during routine maintenance and test.
7. Wiring diagrams and schematics showing function of all electrical components including monitoring network and interface with the FMCS.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

A The generator set shall be continuous duty rated with kW/kVA as shown on the drawings, 1800 RPM, 0.8 power factor, 480 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads as indicated on drawings. Generator set shall be sized to operate at the specified load at a maximum ambient of 104F (40.0C) and altitude of 800.0 feet. Generator shall be UL 2200 listed.

B Continuous Power Rating as defined by the following:

1. Typical Load Factor = 70% or less with variable load
2. Typical Hours per Year = 200 hours
3. Maximum Expected Usage = 500 hours/year
4. Typical Peak Demand = 80% of COP rated kW with 100% of rating available for the duration of an emergency outage

## 2.2 POWER CABLE CONNECTIONS

- A Provide bus work and generator power connection termination box sized in compliance with NEC Article 312 and mechanical type lugs to terminate outgoing power conductors.

## 2.3 MATERIALS AND PARTS

- A All materials and parts comprising the unit shall be new and unused.

## 2.4 ENGINE

- A The engine shall be diesel fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine will utilize in-cylinder combustion technology, as required, to meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder.
- B Emissions requirements / certifications of this package: The proposed generator set shall be EPA Tier II Certified and in compliance with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with EPA Tier II emissions standards per ISO 8178 - D2 Emissions Cycle at specified kW /bHP rating. Utilization of the "Transition Program for Equipment Manufacturers " also known as "Flex Credits" to achieve Tier II certification is not acceptable.
- C Engine Governing: The engine governor shall be an electronic Engine Control Module (ECM) with 24-volt DC Electric Actuator. The ECM shall be enclosed in an environmentally sealed, die-cast aluminum housing which isolates and protects electronic components from moisture and dirt contamination. Speed droop shall be adjustable from 0 (isochronous) to 10%, from no load to full rated load. Steady state frequency regulation shall be +/- 0.25%. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The ECM shall adjust fuel delivery according to exhaust smoke, altitude and cold mode limits. In the event of a DC power loss, the forward acting actuator will move to the minimum fuel position.

## 2.5 GENERATOR

- A The generator shall be a synchronous, three phase, four pole, random wound, single or double bearing, and IP23 drip proof. Bearing(s) shall be double shielded and maintenance free. The insulation system shall meet NEMA MG 1 and UL1446 standards for Class H insulation. Generator temperature rise shall be limited to NEMA MG1 temperature limit of 105C at a 40C ambient. The excitation system shall enable the generator to sustain 300% of rated current for ten seconds during a fault condition and shall improve the immunity of the voltage regulator to non-linear distorting loads. Provide PMG or AREP excitation.

## 2.6 DIGITAL VOLTAGE REGULATOR

- A The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. The voltage regulator shall include a VAR/Pf control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions.
- B The voltage regulator shall communicate with the Generator Control Panel via a J1939 communication network with generator voltage adjustments made via the controller keypad. Additionally, the controller shall allow system parameter setup and monitoring, and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windows compatible environment.
- C Provide isolation transformer ahead of voltage regulator.

## 2.7 GENERATOR CONTROL CABINET

- A Provide control cabinet, mounted on shock absorbers with accessories as outlined below.
1. Solid state LSI sensing output power circuit breaker, rating as shown on drawings.
  2. AC Ammeter 3-1/2 inch panel, type 2 percent accuracy.
  3. AC Voltmeter 3-1/2 inch panel type 2 percent accuracy minimum.
  4. 3 Current Transformers
  5. Ammeter-Voltmeter Phase Selector Switches, including voltage phase-to-phase
  6. Frequency Meter - Direct Reading type, 2 percent accuracy
  7. Panel Lights
  8. Duplex NEMA 5-20R Grounding Convenience Receptacle
  9. Manual Start-Stop Control.
  10. Automatic Start-Stop control.
  11. Remote Start-Stop Control as previously specified.
  12. Two Normally Open and two Normally Closed Auxiliary Contacts for actuation of external control circuits.
  13. Alarm Lights:
    - a. High Water Temperature
    - b. Low Oil Pressure
    - c. Battery Problem
    - d. Overspeed
    - e. Overcrank
    - f. Low Fuel
    - g. Summary Alarm
  14. 3-Position Selector Switch
  15. Relays - heavy duty industrial type, 10-ampere, self-cleaning contacts.
  16. An automatic control panel of the three cranking and three rest period type with alarm to start the engine on failure of normal source of power shall be supplied. The controls shall be such as to shut down the engine on return of normal power. The controls shall contain all auxiliaries as recommended by the engine manufacturer for proper, sure, quick starting of the engine.
  17. Provide automatic exerciser with time clock.

## 2.8 REMOTE ALARM PANEL

- A Provide remote mounted annunciator panel with stand-by battery power. Annunciator shall give visual/audible alarm of impending alarm conditions as required by NFPA 101 and NFPA 110 - Level 1, but not less than what is specified here. Annunciator shall be surface mounted on the wall of the main electrical room.
- B Include the following functions as a minimum:
1. Generator Run Status
  2. Battery Charger Malfunction
  3. Set Derangement
  4. No Fuel
  5. Overheating
  6. Low Oil Pressure
  7. Summary Alarm

## 2.9 SITE MONITORING CAPABILITY

- A The equipment specified here shall be provided with the means to interface via digital network with the UNCC Facility Management and Control System (FMCS) specified under Section 23 09 00.
- B If the equipment specified here does not directly support the required, network interface, the equipment manufacturer shall supply as part of the equipment package, a gateway or converter that will act as a protocol translator to convert the native equipment protocol to FMCS compatible protocol.

- C Any additional wiring or programming associated with configuring any gateways or converters is the responsibility of the equipment manufacturer.
- D Coordinate with Facility Management and Control System Supplier for exact requirements.
- E In addition to the above network requirements provide:
  - 1. Dry contacts to monitor functions as specified under remote alarm annunciator in this Section.
  - 2. Dry contacts to monitor functions as specified under Automatic Transfer Switches Section 26 32 14.

#### 2.10 PIPING

- A Electrical contractor shall provide all necessary fuel and exhaust piping unless otherwise specified.

#### 2.11 COOLING SYSTEM:

- A The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110 F ambient air entering the room or enclosure. The generator set supplier is responsible for providing a properly sized cooling system based on the installed static pressure restriction.

#### 2.12 FUEL SYSTEM

- A The fuel system shall be integral with the engine. In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter/water separator in the fuel inlet line to the engine. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted. Flexible fuel lines shall be minimally rated for 300 degrees Fahrenheit and 100 psi.

#### 2.13 STARTING SYSTEM

- A Starting Motor: A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.
- B Batteries: Batteries - A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system.
- C Battery Charger:
  - 1. A UL listed/CSA certified 10 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float and equalize charge settings, with provisions to automatically switch between the two modes. It shall maintain its rated output voltage within  $\pm 0.2\%$  with AC input variation of  $\pm 10\%$ . Operational monitors shall provide with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of battery charger malfunction, low battery voltage, and high battery voltage. Charger shall include an Analog DC voltmeter and ammeter and fused AC input and DC output, and shall be wall mount type in a NEMA 1 enclosure. Charger shall be capable of recharging a fully discharge set of batteries in eight (8) hours.
  - 2. Battery charger shall be of the automatic, solid state, current limiting, float equalizing type. It shall maintain the battery at normal capacity and recharge battery after cranking. The charger shall accept 120 volt input with appropriate output. It shall be capable of automatically switching from one rate to another rate to meet the needs of the discharged batteries. It shall also have: overload protection, voltage surge suppressers, D.C. ammeter, D.C. voltmeter, low D.C. voltage alarm relay; with a minimum continuous output of 10 amperes D.C. battery charger malfunction alarm contact, and third-party listed.

#### 2.14 JACKET WATER HEATER

- A An engine mounted, thermostatically controlled, immersion type engine coolant heater shall be provided to ensure a minimum acceptable coolant temperature. Heater voltage rating shall be 480 and 240 volts.
- B Provide a contactor in an appropriately rated NEMA enclosure for each heater to automatically disconnect the heater when the engine is running.

## 2.15 FUEL SYSTEM

- A The fuel system shall be of the direct injection type in which fuel is sprayed directly into the cylinder or through a pre-combustion chamber through a spring-loaded nozzle, and combustion shall take place without the use of air cells or auxiliary chambers.
- B Sub-base Fuel Tank
1. Sub-base: Fuel storage tank shall meet all EPA requirements and tank shall be of double wall construction to provide secondary containment of fuel in event of a weld seam failure in the fuel storage section of the tank. Rupture basin section of tank shall be a minimum of 10% of the actual fuel tank capacity.
  2. Tank shall be designed for storage of diesel fuel at atmospheric pressure. The fuel tank shall be designed for support of diesel generator sets, industrial engines with PTO and or pumps. Tank shall be for a stationary installation in accordance with the standard for flammable and combustible liquid code of national fire protection association, NFPA #30. The standard for installation and use of stationary combustion engine and gas turbines, NFPA #37 and the standard for emergency and standby power systems, NFPA #110. Tank shall be UL listed.
  3. Tank shall have a minimum useable capacity to run engine for 8 hours at full continuous rating plus 4 days running at 50% continuous rating and shall have a 5-year warranty against corrosion. Tank shall be constructed of 10-gauge steel plates for both inner and outer skins. All sides and ends and internal cross members/baffles will be constructed of various structural steel channels and I-beams depending on fuel capacity required. All steel shall be wired brush cleaned removing all surface rust and mill scale to ensure no foreign debris enters the fuel storage area. Tank shall be especially treated against corrosion and shall have a 5-year warranty against corrosion damage. Tank exterior shall be treated as specified for the generator set enclosure.
  4. All welding shall be performed by A.W.S. certified welders, documentation of welder certification shall be provided with bid upon customer request. Construction to meet Seismic Zone Two Requirements. Each tank shall have a provision for normal and emergency venting. Vent sizes will be calculated using 100% of the wetted surface area of the four sides and in accordance with U.L.142 specifications.
  5. The vent openings shall be identified and be in addition to filling, withdrawal, or monitoring openings listed below:
    - a. 2 inch N.P.T. Phoenix flanged manual fill
    - b. 3/4 inch N.P.T. Phoenix flanged main tank drain with plug
    - c. 3/4 inch N.P.T. Phoenix flanged secondary tank drain with plug
    - d. 3/4 inch fuel withdrawal pipe extended to bottom of main tank and mitered 45 degrees on pickup end
    - e. 1 1/2 inch N.P.T. Phoenix flanged fuel level monitoring opening in main tank for; Rochester model #8680 direct reading magnetic liquid level gauge
    - f. 1 1/2 inch N.P.T. Phoenix flanged leakage detection system for secondary tank; gem #LS-1800 wired for remote annunciation
    - g. 1 1/2 inch N.P.T. Phoenix flanged low fuel level monitoring system for main tank; Gem #LS-1800 signals light either local or remote
  6. Fuel tank shall have cross members/baffles strategically located to accept engine mounting rails in addition to evenly distributing weight of Zone 4 vibration spring loaded isolated package generator sets
- C Testing:
1. Before painting each tank shall be leak tested at an internal air pressure of 5 psig on both main tank and secondary tank for a period of (1) hour. Using a leakage detection solution in accordance with UL #142 shall check both tanks.
  2. The tank shall incorporate an electrical access area through both the main and secondary tanks located directly below the generator exciter box to allow ample area for connection of generator circuit breaker or output leads.
  3. Lift eyes shall be designed for lifting a minimum of (2) time's maximum rated load of complete package consisting of a minimum of (4) 1-inch lift

## D Fuel Lines:

1. The fuel supply and return lines shall be black iron not less than 3/4" and 1", respectively. The fuel and overflow lines shall be looped near the engine. The construction and installation of the fuel piping and valves including solenoid valve in supply line shall conform to the applicable requirements of NFPA Standard No. 30.

## 2.16 FUEL

- A Contractor shall provide, as part of Division 26 work, a full tank of fuel at no extra cost to the Owner.

## 2.17 EXHAUST PIPING

- A Exhaust piping shall be black seamless or galvanized steel schedule 40 with butt welded or flanged fittings as required of the size recommended by the engine manufacturer. A minimum length of 18 inches of flexible exhaust hose shall be installed between steel piping and engine. Exhaust silencer shall be critical type of the size and type required by the engine manufacturer. Exhaust piping and silencer shall be installed on and supported from set. Piping and silencer exposed to the weather shall be insulated with 4-inches of calcium silicate insulated with canvas cover and outer aluminum sheet jacket with waterproofing treatment.

## 2.18 OUTDOOR NON-WALK-IN ENCLOSURE

- A Provide outdoor enclosure of tamper resistant construction to protect engine generator set against the environment. Housing shall be the manufacturer's standard color. Housing shall be non-walk-in type. Provide suitable reinforced steel concrete pad. Concrete shall be 3000 psi. Provide power connection to battery charger.
- B Provide anti-freeze in radiator for protection of cooling system in -15-degree temperatures.
- C Provide tamper-proof locks and keys.
- D Provide set mounted DC (battery) lights.
- E Provide critical type exhaust silencer and exhaust piping.
- F Provide all necessary louvers.
- G Steps and Platforms: Provide steps and platform if the output circuit breakers are higher than 6'-6" from adjacent ground or pavement.
- H Anchor Bolts: Galvanized steel, of types and sizes as required to comply with the NCSBC seismic anchoring requirements, per Section 26 05 48.
- I Vibration Isolators: Provide vibration isolators, spring/pad type with bumper restraint or snubber as required by the NCSBC, quantity as recommended by the generator set manufacturer.
- J All materials used in the mounting and installation of the load elements shall be suitable for the temperatures encountered, both in normal operation and under fault conditions.
- K Materials in direct contact with the element wire shall be ceramic. Plastics and glass reinforced plastic materials and flammable materials are not acceptable materials of construction for installation, support and mounting of load elements or in the construction of the load bank hot air duct.
- L Base: The generator sets shall be mounted on heavy structural steel base. Steel base shall be mounted on raised concrete base 12" in depth 6" above grade or pavement on vibration isolators. Vibration isolators shall consist of a one-piece elastomeric unit having all metallic surfaces covered with elastomeric material to resist corrosion and environmental degradation. Isolators shall have a non-skid thread integrally molded into the top and bottom contact surfaces.
- M Provide vertical discharge of cooling system exhaust air.

## 2.19 REMOTE EMERGENCY STOP PUSHBUTTON

- A Surface mounted in weatherproof enclosure. Pushbutton shall be protected from accidental operation. Provide label.

## PART 3 EXECUTION:

## 3.1 INSTALLATION

- A Equipment shall be installed by the contractor in accordance with contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products. Of special importance is compliance with the NCSBC seismic design and anchoring requirements and Section 26 05 48 for entire unit and the exhaust piping.
- B Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C Equipment shall be installed on electrical concrete pad for generator enclosure. Pads shall be a minimum of 12" beyond base x 12" deep with No.6 rebar on 12" centers in a horizontal grid pattern. Rebar should clear surfaces by 3" minimum in all directions. Concrete mixture shall be a 1:2:3 mixture of cement, sand, and aggregate with maximum of 4" slump and 28-day compressive strength of 3000psi. Generator set shall be mounted on heavy structural steel base fastened to the concrete pad. Provide pad depth to accommodate the slope of the grade while keeping the pad a minimum of 6" above grade. Generator set shall be mounted using heavy duty, open, stable viscous vibration dampers of the type approved for seismic areas. Vibration dampers shall be mounted between the engine/generator and base frame.
- D Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and requirements of the NCSBC, section 1621 and chapter 17, and section 26 05 48.
- E Equipment shall be initially started and operated by representatives of the manufacturer.
- F All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.
- G Incoming electrical conduits shall be made watertight as they penetrate through concrete base and fuel tank opening and shall transition to flexible conduit to connect to termination enclosure.
- H Contractor shall provide, at contractor's expense, a full tank of diesel fuel after all tests have been completed.

## 3.2 GROUNDING

- A Ground the neutral point of the unit alternator and provide grounding and bonding as required by NEC 250 and by the contract documents.

## 3.3 SUPERVISION

- A The installation shall be supervised, checked, and tested by a qualified representative of the engine-generator manufacturer, and written certification of test sent to Engineer by engine-generator manufacturer's representative.
- B The power generating unit supplier shall include the services of Field Engineers and circuit breaker manufacturer technicians for the following:
  - 1. Supervision of installation of power unit.
  - 2. Proper operation of the power unit to the line side of generator circuit breaker.
  - 3. Start-up test of power unit.
  - 4. Acceptance test of power unit.
  - 5. Check-out of all operating functions of power unit.
  - 6. Set trip functions in circuit breakers

### 3.4 START-UP AND TESTING

- A Coordinate all start-up and testing activities with the Engineer and Owner. Prior to acceptance of the installation, the generator shall be tested in accordance with NFPA 110. This test shall be performed at the job site in the presence of the Owner and Engineer's Representative. After testing is complete:
1. A full tank of fuel shall be provided, replacing any fuel used for testing (N/A for natural gas). Diesel fuel shall be treated with an alcohol-free additive to disperse water and clean the injectors.
  2. A copy of the generator's test report shall be sent to the Engineer of Record, the Owner and made available at Beneficial and Final Inspection to the State Construction Office.
- B After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following:
1. NFPA 110 Load Test Requirements:
    - a. Verify that the equipment is installed properly.
    - b. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, remote annunciator, etc.
    - c. Test all alarms and safety shutdown devices for proper operation and annunciation.
    - d. Check all fluid levels.
    - e. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
    - f. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
  2. Connect the generator to building load and verify that the generator will start and run all designated loads.
- C The system shall be tested under full load and monitor the following readings:
1. Oil pressure
  2. Coolant temperature
  3. Battery charge rate
  4. AC volts
  5. AC Amperes- all phases
  6. Frequency
  7. Kilowatts
  8. Ambient Temperature
  9. The proper hook-up with Facility Management and Control System shall be verified
- D The generator supplier shall conduct load bank test in the presence of Owner using portable load banks provided under this section. The testing shall be in accordance with NFPA110, Chapter #7.13 requirements. All fuel used during tests shall be provided by supplier of units. After the testing is completed a full tank of fuel shall be provided at contractor's expense. Diesel fuel shall be treated with an alcohol-free additive to disperse water and clean injectors, if so recommended by unit manufacturer. Copy of the generator's load test report shall be sent to the engineer of record, the Owner, and the Authority Having Jurisdiction. After testing, provide anti-aging weather treatment for fuel.

### 3.5 FINAL ACCEPTANCE

- A The installation shall be supervised, checked, and tested by a qualified representative of the engine generator manufacturer. Written certification shall be sent to the designer and/or Owner prior to final acceptance.

### 3.6 TRAINING

- A On-Site Training: Provide on-site training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

### 3.7 SPARE PARTS

- A Provide the following parts:

1. Two fuel oil filters
2. Two lube oil filters
3. Two water filters
4. Two pre-charged water filter cartridges
5. Two air cleaners
6. One set valve cover gasket.
7. One alternator belt
8. One fan belt
9. One set fuses for engine controller
10. One hydrometer, battery

3.8 COMMISSIONING

- A This contractor, and the manufacturers of the equipment and materials specified in this section, shall provide the labor, materials, equipment, services, and support required by the project commissioning agent to accomplish the successful commissioning of the equipment and systems specified here.

3.9 DOCUMENTATION

- A Prior to final acceptance, the manufacturer shall supply three (3) copies of complete instruction manuals to the Owner. The manuals shall include operation and maintenance procedures, complete parts lists, dimensional drawings, and unit wiring diagrams and schematics, and interconnection wiring drawings.

3.10 FLASH PROTECTION BOUNDARY:

- A The flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 NFPA 70E and NEC 110-16 requirements. Refer to Section 26 05 74.

END OF SECTION 26 32 00

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## SECTION 26 36 00 - TRANSFER SWITCHES

## GENERAL

## 1.1 RELATED DOCUMENTS

- A Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 260100 "General Provisions - Electrical" apply to this Section.

## 1.2 SUMMARY

- A Section Includes:
  - 1. Automatic Transfer Switch
  - 2. Portable Generator Docking Station
- B Related Requirements:
  - 1. Refer to Section 263213, "Engine Generator Sets" for requirements related to packaged engine generator sets.

## 1.3 REFERENCES

- A Abbreviations and Acronyms
  - 1. EPS: Emergency Power Supply.
  - 2. EPSS: Emergency Power Supply System.
- B Reference Standards
  - 1. National Electrical Contractors Association (NECA)
    - a. NECA 404, "Standard for Installing Generator Sets"
  - 2. National Electrical Manufacturers Association (NEMA)
    - a. NEMA ICS 1, "Industrial Control and Systems General Requirements"
    - b. NEMA ICS 10, "Industrial Control and Systems: Transfer Switch Equipment"
  - 3. Underwriters Laboratories Inc (UL)
    - a. UL1008, "Transfer Switch Equipment".

## 1.4 SEQUENCING

- A Submit the preliminary power system study prior to receiving final approval of equipment and system protective devices submittals and prior to release of equipment drawings for manufacturing. Adjust equipment sizes, frame sizes, and trip units as necessary to achieve performance requirements outlined in Section 260574, "Overcurrent Protection Device Coordination Study".

## 1.5 SUBMITTALS

- A Product Data: Submit for each type of product specified.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
  - 2. Include rated capacities, weights, operating characteristics, electrical characteristics, and accessories.
- B Shop Drawings:
  - 1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
  - 2. Include material lists for each switch specified.
  - 3. Wiring Diagrams: Show connections between transfer switch, power sources, loads, and show any interlocking provisions.
  - 4. Interconnection Diagrams: Show interconnection wiring between transfer switches, generators, annunciators, and control panels. Indicate recommended conduit runs and point-to-point terminal connections.
- C Qualification Data: For qualified manufacturer, installer, and qualified service representative.
- D Seismic Certificates: for transfer switches, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations. The term "withstand" means the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational both during and after the seismic event.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E Closeout Submittals
1. Operation and Maintenance Data: For Generators and components to include in operation and maintenance manuals.
  2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Features and operating sequences, both automatic and manual.
    - b. List of all factory settings and calibration instructions, including software, where applicable.
    - c. Factory test reports.

#### 1.6 QUALITY ASSURANCE

- A Manufacturer Qualifications: A qualified manufacturer whose products have been in satisfactory use in similar service for not less than 10 years. Certified to ISO 9001 International Quality Standard with third-party certification verifying quality assurance in design/development, production, installation, and service.
1. Maintain, within 100 miles of Project site, a 24/7/365 service center capable of providing training, parts, maintenance, and emergency repairs to equipment.
  2. Employ service technicians specifically trained and certified by the generator set and transfer switch manufacturer.
  3. The service center shall maintain a complete inventory of critical power system replacement parts.
  4. The manufacturer shall maintain model and serial number records of each transfer switch provided for a minimum of 20 years.
- B Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project, with a minimum of 5 years successful installation experience on Projects of similar size and complexity.

#### 1.7 COORDINATION

- A Coordinate sizes and locations of concrete bases with dimensions of actual equipment provided.
- B Equipment sizes and equipment layouts shall be considered basis of design. Equipment sizes vary by manufacturer. If proposed equipment is larger than the sizes illustrated, the burden shall be on the Contractor to provide equipment which fits in the space allotted while maintaining all code-required and manufacturer-recommended clearances.
- C Drawings indicate space available for electrical equipment, including clearances between equipment and adjacent surfaces and other items. Equipment installed must comply with all clearance, access and replacement working space requirements of the NEC and Owner

#### 1.8 WARRANTY

- A Comprehensive Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch and all associated components that fail in materials or workmanship within 5 years of Substantial Completion. Include all parts, supplies, labor, and travel associated with repairs with no deductibles.
- B The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.

## PRODUCTS

## 2.1 GENERAL REQUIREMENTS

- A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to the authority having jurisdiction, and marked for intended location and application.
  - 1. Automatic Transfer Switches: listed and marked for emergency use.
- B NFPA Compliance:
  - 1. Comply with NFPA 70. Equipment shall be suitable for use in systems in compliance with Articles 700, 701, and 702.
  - 2. Comply with NFPA 110.
- C Comply with UL 1008.
- D NEMA Compliance: Comply with NEMA ICS 1 and ICS 10.
- E Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
- F Fault-Current Withstand and Closing Ratings (WCR): Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008. UL 1008 WCR ratings must be specifically listed as meeting the requirements for a specific time duration or for use with a specific overcurrent protective device, under specified fault conditions. Base WCR on use of the same set of contacts for the withstand test and the closing test.
  - 1. Short Circuit WCR time duration: 0.05 seconds (3 cycles at 60 Hz).
  - 2. Short-time WCR time duration: 0.5 seconds (30 cycles at 60 Hz).
- G Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- H Start Circuit Monitoring: Provide engine start circuit monitor to continuously monitor the integrity of the generator remote start circuit. Loss of integrity of the remote start circuit(s) through broken, disconnected, or shorted wires shall initiate start the generator(s) to ensure fail safe operation.
- I Enclosure: Surface or Floor mounted, Certified for compliance to NEMA ICS 6 and UL 508.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor and Wet Locations: NEMA 250, Type 3R.
    - c. Corrosive Environments: NEMA 250, Type 4X.
  - 2. Hinged door with permanently mounted key-type latches. All lock assemblies shall be keyed alike.
  - 3. Finish: Factory-applied finish in manufacturer's standard color over a rust-inhibiting primer on treated metal surface.
  - 4. Comply with minimum wire bending space requirements in accordance with NEC, regardless of conduit entry direction.
  - 5. Provide pull section where required for bottom fed, front accessible only installations.
- J Service Entrance Rated Transfer Switch:
  - 1. Comply with UL 869A and UL 489.
  - 2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
  - 3. Provide the bonding connection on the neutral bus for systems with a neutral.
  - 4. Provide removable link for temporary separation of the service and load grounded conductors.
  - 5. Provide surge protective device in accordance with Section 264300 "Surge Protection Devices."
  - 6. Service Disconnecting Means: Externally operated, manual actuated circuit breaker, molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
    - a. Tripping Characteristics: Adjustable long-time, short-time, instantaneous delay, and ground fault.

- b. Provide equipment ground fault protection for all overcurrent protective devices 1000 amps or greater on 480Y/277V systems.
  - c. Provide arc energy reduction maintenance switch for all overcurrent protective devices rated 1200 amps or greater or where the continuous current trip setting can be adjusted to 1200A or greater.
- K Provide 4-pole ATS (switched neutral) wherever upstream ground-fault protection is used.
- L Where multiple ATS are installed, stagger the retransfer to normal such that each ATS retransfers at least 15 seconds apart.

## 2.2 AUTOMATIC TRANSFER SWITCHES

- A Manufacturers: Subject to compliance with requirements, provide product from one of the following:
1. Asco 300 Series
  2. Cummins
  3. Russelectric RTSCD
- B Source Limitations: Obtain packaged generator sets, automatic transfer switches and auxiliary components through one source.
- C Switch Characteristics: Contactor type, designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitations: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable unless noted otherwise.
  2. Switch Action: Double throw; mechanically held in both directions.
  3. Switch Contacts:
    - a. Silver composition or High-pressure silver alloy for load-current switching.
    - b. Provide contact assemblies with arc chutes for positive arc extinguishing. Include insulating covers to prevent inter-phase flashover.
    - c. Encapsulate contacts to increase phase-to-phase isolation and reduce the possibility of arcing between phases.
    - d. Positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
    - e. Provide switches rated 150A and higher, with segmented blow-on construction and separate arcing contacts.
  4. Contacts operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
  5. Conductor Connectors: Suitable for use with conductor material and sizes.
  6. Material: Hard-drawn copper, 98 percent conductivity.
  7. Main, Neutral, and Ground Lugs: Mechanical type, suitable for the material, number, and size of conductors indicated on the drawings.
  8. Bus-Configured Terminators: Mechanical type.
  9. Connectors shall be marked for conductor size and type according to UL 1008.
  10. Manual Switch Operation: Manual, non-electric operation, for service use only under no-load conditions with the enclosure door open. Control circuit automatically disconnects from electrical operator during manual operation. Provide permanently attached manual operating handles.
- D Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism.
- E Factory Wiring: Internal wiring composed of premanufactured harnesses that are permanently marked for source and destination. Connected to control system by means of locking disconnect plug(s), to allow control system to be easily disconnected and serviced without disconnecting power from transfer switch mechanism.
- F Field Control Wiring Interconnections: Screw type terminal blocks, appropriate for field wiring, clearly and permanently labeled.
- G Neutral Switching: As indicated on drawings

1. For transfer switches indicated as 4-pole, provide a switched neutral pole with the same ratings and matching construction as the phase poles. All poles shall be switched simultaneously using a common crossbar. Use of overlapping neutral contacts is not acceptable.
  2. For transfer switches indicated as 3-pole, provide a solid neutral bus and lugs. Size the neutral bus to carry 100 percent of the current designated on the switch rating.
- H Automatic Programmed/Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller.
1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from 0 to 60 seconds, and factory set for one second.
  2. Mechanically and electrically interlock sources to prevent closing both sources on the load at the same time.
  3. Fully automatic break-before-make operation with center off position.
- I Electromechanical Non-Automatic Switch Operation: Requires user action to operate transfer switch using manual selector switches.
1. Electrically actuated by push buttons designated "Normal Source" and "Alternative Source" and coordinated with control function.
  2. Capable of transferring load in either direction with either or both sources energized, under load, and with enclosure door closed.
- J Communication Interface: Integrated communication capability with the following minimum interfaces:
1. One RS485 serial communication port and two TCP/IP Ethernet ports for interface with a network of generator controller(s), transfer switch(es), annunciator(s), and other remote programming devices.
  2. One USB communication port for PC service interface.
- K Automatic Transfer-Switch Controller Features:
1. Microprocessor based, password protected, sealed membrane LCD digital display mounted on and operational from enclosure door, with integral pushbuttons and LED status indicators.
    - a. All settings shall be configurable locally through display or remotely through PC based service tool interfaced with serial communications port. DIP switches or other electromechanical devices are unacceptable.
  2. Power Supply: Powered from available sources and generator set battery. Capable of operating through a loss of control power. Field configurable for any operating voltage level up to 600 VAC.
    - a. Provide integrated DC power supply with the ability to automatically switch between isolated inputs and utilize best available DC source.
    - b. Incorporate non-volatile memory. Should power be interrupted and subsequently restored, control settings and parameters saved in protected memory shall not be lost and should restore system to its last operating state without requiring user input.
  3. Comply with or exceed the following requirements for Electromagnetic Compatibility (EMC):
    - a. EN 61000-6-2 Generic standards: Immunity for industrial environments.
    - b. EN 61000-4-2 Electrostatic Discharge Immunity.
    - c. EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity.
    - d. EN 61000-4-4 Electrical fast transient/burst immunity.
    - e. EN 61000-4-5 Surge immunity
    - f. EN 61000-4-6 Conducted Immunity.
    - g. EN 61000-4-8 Power Frequency Magnetic Field.
  4. Voltage, Current, Frequency, and Phase Rotation Sensing: for both normal and emergency sources, continuously monitored, on all three phases, without external transformers, field adjustable in 1 percent increments.
    - a. Undervoltage:

- 1) Pickup: 85 to 100 percent of nominal.
  - 2) Dropout: 75 to 98 percent of nominal.
  - 3) Dropout Time Delay: 0.1 to 1.0 seconds
- L Overvoltage:
- a. Pickup: 95 to 99 percent of dropout
    - 1) Dropout: 105 to 135 percent of nominal
    - 2) Dropout Time Delay: 0.5 to 120.0 seconds
  - b. Over- and Under- frequency
    - 1) Pickup: plus or minus 5 to 20 percent of nominal
    - 2) Dropout: plus or minus 1 percent beyond pickup
    - 3) Dropout Time Delay: 0.1 to 15.0 seconds
  - c. Voltage Imbalance
    - 1) Pickup: 90 percent of dropout
    - 2) Dropout: 2 to 10 percent
    - 3) Time Delay: 2.0 to 20.0 seconds
  - d. High Neutral Current
    - 1) Pickup: 100 to 150 percent of nominal.
    - 2) Warning Delay: 10 to 60 seconds.
  - e. Phase Loss and Phase Rotation.
    - 1) Time Delay: 100 milli-seconds
2. Built-in, Adjustable Time Delays:
- a. Engine Start: 0 to 120 seconds.
  - b. Transfer to Emergency Source: 0 to 120 seconds.
  - c. Retransfer to Normal Source: 0 to 30 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
  - d. Engine Stop/Cooldown: 0 to 30 minutes.
  - e. Programmed/Delayed Transition (where specified): 0 to 600 seconds.
3. Power Meter: Integrated into controller for load metering. Include data logging to track peak demand for a minimum of 24 months. Measure and display the following parameters:
- a. Line to line and line to neutral voltage.
  - b. Line and neutral current.
  - c. Frequency.
  - d. Apparent Power, per phase and 3-phase total.
  - e. Active Power, per phase and 3-phase total.
  - f. Reactive Power, per phase and 3-phase total.
  - g. Power Factor, per phase and 3-phase total.
  - h. THD.
  - i. Historical Peak Demand kW
4. LED Indicating Lights:
- a. Switch-Position: Indicate source to which load is connected.
  - b. Source-Available: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
    - 1) Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    - 2) Emergency Power Supervision: Red or yellow light with nameplate engraved "Emergency Source Available."
  - c. Switch set to non-automatic operation.
  - d. Control disabled.
  - e. Switch in test/exercise mode.
5. Pushbutton Switches:
- a. Test Switch: Activates or cancels preprogrammed test sequence to simulate normal-source failure with or without load.

- b. Override Switch: Override any programmed time delays for engine start, transfer, and retransfer, and immediately go to the next operation.
- c. Fault Reset Switch: Dedicated control switch to reset/clear fault conditions.
- d. Lamp Test Switch: Simultaneously illuminates all panel LEDs.
6. Digital Display: UV protected, color, alphanumeric, capable of recording and displaying the following information:
  - a. Real time power data for each phase and source.
  - b. Real time clock data.
  - c. System Statistics: including source availability, hours each source has been connected to the load, the number of times transferred, transfer times, and the total number of times each source has failed.
  - d. All event data in chronological order.
  - e. All active alerts in chronological order with alert type, fault codes, fault description, and time stamp.
  - f. Transfer Switch controller information, software version data, and serial/model numbers.
7. Contacts:
  - a. Digital Input/Output Contacts: Minimum 4 digital inputs and 4 solid state digital output relays with assignable functions.
  - b. Auxiliary Contacts: Isolated and driven by transfer switch mechanism, indicating switch position. Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 250-V AC.
  - c. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 5 A at 30-V DC minimum.
  - d. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
  - e. Signal-Before-Transfer and Post Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval adjustable from 0 to 600 seconds, and coordinated with any elevator equipment provided for the project.
  - f. Load Shed Circuit: Capable of moving switch to a neutral position when a signal is initiated from an external device, bypassing all time delays.
8. 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 using preset schedules. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be 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 unavailable.
9. Security: Multi-level password security designed to restrict user access. Provide the following minimum access levels:
  - a. User Level: Modifiable password that prevents unauthorized users from accessing setup screen and initiating tests using the test button on operator panel.
  - b. Advanced: allows users access to advanced parameters.
- M Service: allows users (authorized services technicians only) access to advanced and service screens.

### 2.3 TRANSFER SWITCH REMOTE ANNUNCIATOR

- A Source Limitations: Same manufacturer as transfer switch in which installed.
- B Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.

- C Suitable for flush mounting in wall unless indicated otherwise.
- D Annunciation panel display shall include the following indicators:
  - 1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
  - 2. Switch position.
  - 3. Switch in test mode.
  - 4. Failure of communication link.
- E Annunciator Panel: LED-lamp type with audible signal and silencing switch.
  - 1. Indicating Lights: Grouped for each transfer switch monitored.
  - 2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
  - 3. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
  - 4. Lamp Test: Push-to-test or lamp-test switch on front panel.
- F Malfunction of annunciator or communication link shall not affect functions of transfer switch. In the event of failure of communication link, transfer switch automatically reverts to standalone, self-contained operation.
- G Transfer switch sensing, controlling, and operating function independent of remote panel. Remote annunciation system shall not prevent transfer to alternate source when primary power source fails, nor prevent return to primary source if alternate source fails.

#### 2.4 PORTABLE GENERATOR DOCKING STATION

- A Description: Provide a means to connect temporary emergency power from portable generators to a facility EPSS in accordance with NEC requirements.
- B Manufacturers: Subject to compliance with requirements provide product from one of the following:
  - 1. Asco
  - 2. ESL
  - 3. Power Temp Systems
  - 4. Trystar
- C Docking Station Characteristics:
  - 1. Comply with UL1008.
  - 2. Nominal System Voltage and Main Bus Ratings as indicated on drawings.
  - 3. Hinged outer access door with provisions for padlock.
  - 4. Dead front panel covering all permanent connections with steel barriers for separation of permanent and temporary connection chambers.
  - 5. Factory installed phase rotation monitor.
  - 6. 2-wire auto start terminal posts for connection of engine start circuit from portable generator.
  - 7. Trapped key interlock system to prevent back-feeding or paralleling of permanent and portable generators.
  - 8. Battery Charging Receptacle, 5-20R.
  - 9. Block Heater Receptacle, L5-30R.
  - 10. Load Bank Dump Circuit, where indicated on drawing
- D Permanent Connections:
  - 1. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 2. Bus Material: Hard-drawn copper, 98 percent conductivity.
  - 3. Phase and Neutral Lugs: Mechanical type.
  - 4. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  - 5. Permanent Connectors shall be marked for conductor size and type according to UL 1008.
- E Temporary Connections:
  - 1. Connectors: 16 series Camlok bus bar mount receptacles with flip covers.
    - a. Color coded according to system voltage requirements.
    - b. Male for portable generator connectors.
    - c. Female for load bank connectors where indicated on drawings.
  - 2. Hinged access cover at bottom of enclosure for entry of temporary portable generator cables. Arranged to allow cable entry only after the outer access door has been opened.

- F Circuit Breakers: molded-case, electronic-trip type; 100 percent rated; complying with UL 489; arranged as indicated on drawings.
  - 1. Tripping Characteristics: Adjustable long-time, short-time, and instantaneous delay.
  - 2. Mounting: Adjacent to or integrated with control and monitoring panel. Isolated from vibrations induced by the generator set.
  - 3. Mechanical type lugs, sized for the conductors shown on drawing, shall be supplied on the load side of breaker.
  - 4. Provide equipment ground fault protection for all overcurrent protective devices 1000 amps or greater on 480Y/277V systems.
  - 5. Provide arc energy reduction maintenance switch for all overcurrent protective devices rated 1200 amps or greater or where the continuous current trip setting can be adjusted to 1200A or greater.
- G Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Switch and overcurrent protective device short circuit ratings shall be at least 110 percent of the actual available fault current.

## 2.5 SOURCE QUALITY CONTROL

- A Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. 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. Calibrate all sensors.
- B Prepare test and inspection reports.
  - 1. For each of the tests required by UL 1008, performed on representative devices, for emergency and legally required systems. Include results of test for the following conditions:
    - a. Overvoltage.
    - b. Undervoltage.
    - c. Loss of supply voltage.
    - d. Reduction of supply voltage.
    - e. Alternative supply voltage or frequency is at minimum acceptable values.
    - f. Temperature rise.
    - g. Dielectric voltage-withstand; before and after short-circuit test.
    - h. Overload.
    - i. Contact opening.
    - j. Endurance.
    - k. Short circuit.
    - l. Short-time current capability.
    - m. Receptacle withstand capability.
    - n. Insulating base and supports damage.
- C Product will be considered defective if it does not pass factory tests and inspections.

## EXECUTION

### 3.1 INSTALLATION

- A Comply with manufacturers' written installation, application, and alignment instructions and with NFPA 70 and NFPA 110.
- B Install floor mounted transfer switches on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Division 03 and Section 260500, "Common Work Results for Electrical Systems."
  - 1. Install conduits entering underneath the Transfer Switch, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Install anchor bolts to elevations required for proper attachment to Transfer Switch.
- C Install wall mounted transfer switches plumb and rigid without distortion of enclosure.
1. Provide steel slotted support structures where required for freestanding equipment or where building mounting surface is unsuitable.
  2. Where mounted in groups, align top of trim or tub for all panels in an area.

### 3.2 CONNECTIONS

- A Coordinate with all trades for transfer switch interface with other building systems.
- B Provide all interconnection wiring and raceway between system components and equipment. Install and connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
1. Provide Class D extra flexible stranded conductors for all connections to genset.
  2. Control conductors installed between the transfer equipment, emergency generator, and docking station shall be kept entirely independent of all other wiring in accordance with NEC.
  3. Install wiring in raceways except within electrical enclosures. Size raceways to accommodate manufacturer's wiring requirements. Comply with Section 260526 "Raceways and Boxes for Electrical Systems".
- C 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-486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, use a calibrated torque tool to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.
- D Wiring to Remote Components: Match type and number of cables and conductors to generator sets, 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.

### 3.3 IDENTIFICATION

- A Comply with requirements in Section 260553 "Identification for Electrical Systems."
1. For equipment with temporary connections to a portable generator, provide warning sign near the connections that displays one of the following warnings, matching the permanent generator configuration:
    - a. FOR CONNECTION OF A SEPARATELY DERIVED (BONDED NEUTRAL) SYSTEM ONLY
    - b. FOR CONNECTION OF A NONSEPARATELY DERIVED (FLOATING NEUTRAL) SYSTEM ONLY

### 3.4 ADJUSTING

- A Set field-adjustable intervals and delays, relays, and engine exerciser clock.

### 3.5 FIELD QUALITY CONTROL

- A Engage a factory-authorized service representative to inspect and adjust components, assemblies, and equipment installations, including connections, and to assist in start-up and testing.
- B The factory-authorized service representative shall perform a site evaluation prior to test and inspections to verify the equipment is installed in accordance with the manufacturer's instructions. Equipment shall be initially started and operated by the authorized service representative.
- C Provide 7-day advance notice of any testing to allow The Engineer and Owner's Representative the option to witness the tests.

- D Pre-Operational Tests and Inspections
1. Visual and Mechanical Inspection:
    - a. Examine equipment nameplate data and confirm proper identification.
    - b. Inspect the physical, electrical, and mechanical condition of the equipment and all components in accordance with the manufacturers' instructions.
    - c. Inspect anchorage, alignment, and grounding.
    - d. Verify that the unit is clean.
    - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    - f. Verify that warning labels and signs are attached and visible.
    - g. Verify tightness of all control connections.
    - h. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
    - i. Perform manual transfer operation.
    - j. Verify positive mechanical interlocking between normal and alternate sources.
  2. Electrical and Mechanical Tests:
    - a. Verify settings and operation of control devices.
    - b. Calibrate and set all relays and timers.
    - c. Verify phase rotation, phasing, and synchronized operation.
- E Operational Tests: After electrical circuitry has been energized, test for compliance with performance requirements.
1. Perform manual transfer tests.
  2. Perform automatic transfer tests:
    - a. Simulate loss of normal power.
    - b. Return to normal power.
    - c. Simulate loss of emergency power.
    - d. Simulate all forms of single-phase conditions.
  3. Verify correct operation and timing of the following functions:
    - a. Normal source voltage-sensing and frequency-sensing relays.
    - b. Engine start sequence.
    - c. Time delay upon transfer.
    - d. Alternate source voltage-sensing and frequency-sensing relays.
    - e. Automatic transfer operation.
    - f. Interlocks and limit switch function.
    - g. Time delay and retransfer upon normal power restoration.
    - h. Engine cool down and shutdown feature.
  4. Verify voltage and frequency pickup and dropout by data readout or inspection of control settings.
  5. 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.
- F Functional Acceptance Testing:
1. Test the complete automatic transfer switch system and generator control system concurrently to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
- G Transfer switches will be considered defective if they do not pass tests and inspections.
- H Remove and replace malfunctioning units and retest as specified above.
- I Prepare test and inspection reports.
- J Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each switch. Remove all access panels so terminations and connections are accessible to portable scanner.
1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 DEMONSTRATION

- A Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
- B Coordinate training with training for generator equipment.

3.7 MAINTENANCE SERVICE

- A Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance and calibrations as recommended by manufacturer and adjusting as required for proper operation. Include manufacturer's authorized replacement parts and supplies.

END OF SECTION 26 36 00