

PROJECT MANUAL

VOLUME 1

**NORTH CAROLINA STATE UNIVERSITY**

COE GROWTH - RESEARCH LAB RENOVATION - FITTZ-  
WOOLARD HALL

915 PARTNERS WAY, RALEIGH, NC 27606

BSA # 12240030.70

NCSU # 202420009

SCO ID # 24-27636-01A

NOVEMBER 11, 2024

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CONSTRUCTION SET\_ISSUED FOR CONSTRUCTION

**BSA**

**NC STATE  
UNIVERSITY**



**NC State University – Project Management**

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**Design Project Manager**

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Name: Michele Maxwell  
Title: Formal Design Project Manager  
Phone: 919-513-3750  
Email: [mmaxwe2@ncsu.edu](mailto:mmaxwe2@ncsu.edu)

**Construction Project Manager**

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Name: James Cox  
Title: Senior Project Manager  
Phone: 919-219-1381  
Email: [Jrcox4@ncsu.edu](mailto:Jrcox4@ncsu.edu)

**Design Team**

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**Architect**

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BSA LifeStructures

Name: Mark Searls  
Title: Principle  
Phone: 919-334-0691  
Email: [msearls@bsals.com](mailto:msearls@bsals.com)

Name: Tyler Scire  
Title: Architect  
Phone: 919-334-0707  
Email: [tscire@bsals.com](mailto:tscire@bsals.com)

**Plumbing, Mechanical, and Electrical**

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McKim and Creed

Name: Dane Wallin  
Title: Engineer  
Phone: 704-962-6712  
Email: [dwallin@mckimcreed.com](mailto:dwallin@mckimcreed.com)

Name: Xing Zhou  
Title: Engineer  
Phone: 919-233-8091  
Email: [xzhou@mckimcreed.com](mailto:xzhou@mckimcreed.com)

Name:  
Title:  
Phone:  
Email:

**Structural Engineer**

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N/A

Name:  
Title:  
Phone:  
Email:

**Civil Engineer**

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N/A

Name:  
Title:  
Phone:  
Email:

**Landscape Architect**

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N/A

Name:  
Title:  
Phone:  
Email:

**Audiovisual Consultant**

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N/A

Name:  
Title:  
Phone:  
Email:

**Telecom Consultant**

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N/A

Name:  
Title:  
Phone:  
Email:

**Lab Planner**

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BSA LifeStructures

Name: Timmothy Stratton  
Title: Lab Planner  
Phone: 919-334-0474  
Email: [tstratton@bsals.com](mailto:tstratton@bsals.com)

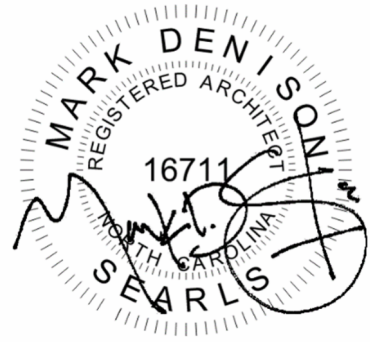


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ARCHITECT

Mark Searls  
16711  
BSA Life Structures  
510 Glenwood Ave, Suite 321  
Raleigh, NC 27603-1262  
919-334-7301



FIRE PROTECTION ENGINEER

Dane J. Wallin  
046612  
McKim & Creed  
4300 Edwards Mill Road, Suite 200  
Raleigh, NC 27612  
919-233-8091



PLUMBING ENGINEER

Dane J. Wallin  
046612  
McKim & Creed  
4300 Edwards Mill Road, Suite 200  
Raleigh, NC 27612  
919-233-8091



MECHANICAL ENGINEER

Dane J. Wallin  
046612  
McKim & Creed  
4300 Edwards Mill Road, Suite 200  
Raleigh, NC 27612  
919-233-8091





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**ELECTRICAL & FIRE ALARM ENGINEER**

Xing Zhou  
052051  
McKim & Creed  
4300 Edwards Mill Road, Suite 200  
Raleigh, NC 27612  
919-233-8091

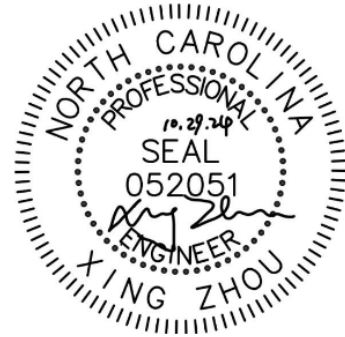




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## Advertisement for Bids & Notice of Public Meeting for Proposed Alternate Bids for Preferred Products

Sealed proposals will be received by NC State University. Attention James Cox, until (time) on (date) in Conference Room (room #), Administrative Services III Building 2601 Wolf Village Way, Raleigh, NC 27695 and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment for the construction (OR OTHER DESCRIBED ACTIVITY) of:

NC State University  
COE GROWTH - RESEARCH LAB RENOVATION – FITTZ-WOOLARD HALL  
SCO ID No.: 24-27636-01  
NC State Project No.: 202420009

Selective scope within three work areas totaling 4,072 SF across two floors of an existing building. Scope to include selective demolition, architectural renovation, lab furnishing/equipment, interior finishes, plumbing, mechanical, electrical, fire protection and fire alarm.

Bids will be received for **single prime bid** contracts. All Proposals will be lump sum.

### BID OPENING:

COE GROWTH - RESEARCH LAB RENOVATION – FITTZ-WOOLARD HALL  
meeting information.

When: Month Date, 202X at X:00 am/pm Eastern Time

This meeting requires advance registration using the link below to attend the meeting. (if applicable)  
[Virtual Meeting Link](#)

Meeting ID No. (number) (if applicable)

Registrants will receive a calendar invitation via email. (if applicable)

### The following General Contractors have been pre-qualified to bid this job

- BridgePoint Durham, NC
- RBI Durham, NC
- 35 North, Durham, NC
- CMC Building, Bolton, NC
- Monteith, Raleigh, NC
- CT Wilson, Durham, NC
- IL Long, Winston Salem, NC
- McKenna Construction, Raleigh, NC
- Progressive Contracting, Raleigh, NC
- Riggs-Harrod, Raleigh, NC
- Salisbury & Moore, Raleigh, NC

Bid documents are available for examination in the plan rooms:

1. iSQFT; <http://www.isqft.com/start/> handles Associated General Contractors plan room.
2. The local North Carolina offices of Dodge Data and Analytics;
3. The Eastern Regional Offices of CMD Group in Norcross, GA;
4. The offices of the Designer: (DESIGNER FIRM NAME AND ADDRESS);
5. The North Carolina Institute of Minority Economic Development, Inc. (NCIMED) Plan and Resource Center at 114 W. Parrish St., 6<sup>th</sup> Floor, Durham, NC; 919-956-8889 or 919-287-3036
6. The Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh Areas – 877-227-1680;



Complete plans and specifications for this project in electronic format can be obtained from (DESIGNER'S NAME AND ADDRESS) during normal office hours after (DATE). Email requests for the electronic documents may be sent to (DESIGNER EMPLOYEE'S EMAIL ADDRESS.) Full printed copies may be obtained by those qualified as prime bidders, upon deposit of (WRITE OUT DOLLAR VALUE) (\$XXX) in cash or certified check with a minimum of 48 hours' notice to (DESIGNER EMPLOYEE'S EMAIL ADDRESS). The full plan deposit will be returned to those bidders provided all documents are returned in BOUND, good, usable condition within ten (10) days after the bid date.

Partial or full printed copies of the project documents may be purchased from (PRINTING COMPANY NAME AND ADDRESS). Phone number for ordering is XXX-XXX-XXXX. Documents may also be purchased from Document Imaging Systems, Inc. at 231 East Johnson Street, Units E, F, & G, Cary, NC 27513. Phone number for ordering is 919-460-9440.

The State reserves the unqualified right to reject any and all proposals.

North Carolina State University has an affirmative policy of fostering, promoting and conducting business with minority owned enterprises. Minority contractors are encouraged to participate in the bidding process.

The bidder must include completed minority business subcontractor documentation form(s) with their proposal or the bid may be considered non-responsive and invalid.

#### **Pre-Bid Meeting**

Project Name virtual meeting information. (if applicable)

When: Month Date, 202X at X:00 am/pm Eastern Time

This meeting requires advance registration using the link below to attend the meeting. (if applicable)

Virtual Meeting Link

Meeting ID No. (number) (if applicable)

Registrants will receive a calendar invitation via email. (if applicable)

#### **(Option for new building or simple renovation):**

A Pre-bid meeting will be held for all interested bidders on (date and time) in Room (Room #) of Administrative Services III Building at 2701 Sullivan Drive, Raleigh, NC 27695. The meeting will address project specific questions.

#### **(Option for complex renovation)**

A Pre-bid meeting and site visit will be held for all interested bidders on two occasions:

(DATE AND TIME), AND (DATE AND TIME) in room (room #) of (Name of building and address).

**ATTENDANCE AT ONE OF THE PRE-BID MEETINGS IS MANDATORY.** The meeting will address project specific questions and provide an opportunity for bidders to assess the project's existing conditions.

#### **Notice of Public Meeting for Proposed Alternate Bids for Preferred Products. (if applicable)**

Project Name virtual meeting information. (if applicable)

When: Month Date, 202X at X:00 am/pm Eastern Time

This meeting requires advance registration using the link below to attend the meeting. (if applicable)

Virtual Meeting Link

Meeting ID No. (number) (if applicable)

Registrants will receive a calendar invitation via email. (if applicable)

An open public meeting will be held on (DATE AND TIME) in Room (room #) of Administrative Services III Building at 2601 Wolf Village Way, Raleigh, NC 27695. The meeting is to identify preferred brand alternates and their performance standards pertinent to this project.

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**NC State University**  
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In accordance with GS133-3, Section 64. (C) and State Construction Office procedures the following preferred brand items are being considered as Alternates by the owner for this project:

Electrified Door Hardware  
Mechanical Door Hardware  
Building HVAC Controls  
Energy Management Meters

A copy of pertinent sections of the performance standards may be obtained by contacting the designer at the address or phone number noted above.

**Project Manager**  
NC State University  
Capital Project Management  
XXXXXXXX@ncsu.edu  
919.51X.XXXX

REQUEST FOR GENERAL CONTRACTOR  
PREQUALIFICATION SUBMITTALS  
COE Growth – Research Lab Renovation – Fitts Woolard Hall

North Carolina State University is seeking qualification statements from general contractors for improvements to COE Growth – Research Lab Renovation - FWH located on Centennial Campus. The project scope includes condensing a teaching lab to vacate a space to renovate into a research lab on third floor and reconfiguring space on the first floor to include 3 new driving simulators. Added scope to this project will include renovation of a shell space on the first floor to include two research labs.

To qualify, the contractor must have a general contractor’s license in the State of North Carolina as well as applicable bonding requirements. The contractor must show comparable work experience, both in complexity and dollar value, and preferably in a university campus environment, to the scope of work outlined above.

To be considered, the contractor must obtain an application package from the NC State University Project Manager and submit a fully completed qualification document by 5:00pm, August 30, to Michele Maxwell, project manager, by email only to [DC\\_Formal\\_Prequal@ncsu.edu](mailto:DC_Formal_Prequal@ncsu.edu). **No hard copies will be accepted.** Application packages will be available electronically after August 5, 2024. Please contact the project manager via email (preferred) or phone to request a package or download it from the link below.

Application packages must be submitted to the following email address:

[DC\\_Formal\\_Prequal@ncsu.edu](mailto:DC_Formal_Prequal@ncsu.edu)

***NOTE: The SCO Prequalification Package has been updated recently. Please use the project-specific form provided by NC State by the link below. Submissions on any other form will be considered nonresponsive.***

NC State University has an affirmative policy of fostering, promoting, and conducting business with women and minority owned enterprises. Women and minority contractors are encouraged to participate in the prequalification process.

Michele Maxwell  
North Carolina State University  
Design & Construction  
919-513-3750  
Email (questions only): [mmmaxwe2@ncsu.edu](mailto:mmmaxwe2@ncsu.edu)

[Rev WRD 02-15-2024](#)

## **INSTRUCTIONS TO BIDDERS**

**For a proposal to be considered it must be in accordance with the following instructions:**

### **1. PROPOSALS**

Proposals must be made in strict accordance with the Form of Proposal provided therefor, and all blank spaces for bids, alternates, and unit prices applicable to bidder's work shall be properly filled in. When requested alternates are not bid, the proposer shall so indicate by the words "No Bid". Any blanks shall also be interpreted as "No Bid". The bidder agrees that bid on Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Photocopied or faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates. If figures and writing differ, the written number will supersede the figures.

Any modifications to the Form of Proposal (including alternates and/or unit prices) will disqualify the bid and may cause the bid to be rejected.

The bidder shall fill in the Form of Proposal as follows:

- a. 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.
- b. 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.
- c. 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.
- d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable.
- e. All signatures shall be properly witnessed.
- f. If the contractor's license of a bidder 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 proposal. The title "Licensee" shall appear under his/her signature.

Proposals should be addressed as indicated in the Advertisement for Bids and be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders should clearly mark on the outside of the bid envelope which contract(s) they are bidding.

Bidder shall 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 or an affidavit indicating work under contract will be self-performed, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid.

For projects bid in the single-prime alternative, the names and license numbers of major subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the bidder to deliver his bid to the proper official at the selected place and prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delivery by any delivery service, shall disqualify the bid.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work. See General Conditions, Article 19c-1.

## **2. EXAMINATION OF CONDITIONS**

It is understood and mutually agreed that by submitting a bid the bidder acknowledges that he has carefully examined all documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the work under the contract, and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications and other contract documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with other contractors performing work on the site.

Reference is made to contract documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the designer in preparing the documents. The owner will make copies of all such surveys and reports available to the bidder upon request.

Each bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the owner. Any reasonable request for access to the site will be honored by the owner.

## **3. BULLETINS AND ADDENDA**

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in closing a contract they will become a part thereof. It shall be the bidder's responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the bidder find discrepancies in, or omission from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the designer who will send written instructions in the form of addenda to all bidders. Notification should be no later than seven (7) days prior to the date set for receipt of bids. Neither the owner nor the designer will be responsible for any oral instructions.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal. However, even if not acknowledged, by submitting a bid, the bidder has certified that he has reviewed all issued addenda and has included all costs associated within his bid.

#### **4. BID SECURITY**

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a bid bond in an amount equal to not less than five percent (5%) of the proposal, said deposit to be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law (G.S. 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The owner may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the owner. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts, and no later than seven (7) days after expiration of the holding period stated in the Notice to Bidders. Standard Form of Bid Bond is included in these specifications and shall be used.

#### **5. RECEIPT OF BIDS**

Bids shall be received in strict accordance with requirements of the General Statutes of North Carolina. Bid security shall be required as prescribed by statute. Prior to the closing of the bid, the bidder will be permitted to change or withdraw his bid. Guidelines for opening of public construction bids are available from the State Construction Office.

#### **6. OPENING OF BIDS**

Upon opening, all bids shall be read aloud. Once bidding is closed, there shall not be any withdrawal of bids by any bidder and no bids may be returned by the designer to any bidder. After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default and fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The owner reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

- a. If the Form of Proposal furnished to the bidder is not used or is altered.
- b. If the bidder fails to insert a price for all bid items, alternate and unit prices requested.
- c. If the bidder adds any provisions reserving the right to accept or reject any award.
- d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.
- e. If the bidder fails to complete the proposal form where information is requested so the bid may be properly evaluated by the owner.
- f. If the unit prices contained in the bid schedule are unacceptable to the owner and the State Construction Office.
- g. If the bidder fails to comply with other instructions stated herein.

## **7. BID EVALUATION**

The award of the contract will be made to the lowest responsible bidder as soon as practical. The owner may award on the basis of the base bid and any alternates the owner chooses.

Before awarding a contract, the owner may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

- a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the owner.
- b. A listing of completed projects of similar size.
- c. Permanent name and address of place of business.
- d. The number of regular employees of the organization and length of time the organization has been in business under present name.
- e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.
- f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.
- g. If prequalified, contractor info will be reviewed and evaluated comparatively to submitted prequalification package.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of any bidder.

In determining the lowest responsible, responsive bidder, the owner shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c), the past performance of the bidder on construction contracts for the State with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and owner. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) shall constitute a basis for disqualification of the bid.

Should the owner adjudge that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned to him.

## **8. PERFORMANCE BOND**

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

## **9. PAYMENT BOND**

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

## 10. PAYMENTS

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates. See Article 31, General Conditions.

## 11. PRE-BID CONFERENCE

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

## 12. SUBSTITUTIONS

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

Submittals for proposed substitutions shall include the following information:

- a. Name, address, and telephone number of manufacturer and supplier as appropriate.
- b. Trade name, model or catalog designation.
- c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.
- d. Detailed comparison with specified products including performance capabilities, warranties, and test results.
- e. Other pertinent data including data requested by the Designer to confirm product equality.

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



**GUIDELINES FOR  
RECRUITMENT AND SELECTION OF MINORITY BUSINESSES  
FOR PARTICIPATION IN THE UNIVERSITY OF NORTH CAROLINA  
CONSTRUCTION CONTRACTS**

In accordance with G.S. 116-31.11 and G.S. 143-128.2 these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, design-build, public-private partnership, and alternative contracting methods, on University of North Carolina construction projects in the amount of \$100,000 to \$4,000,000. The legislation provides that the State, including the University of North Carolina System, 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 through The University of North Carolina, its constituent institutions, and/or affiliates (hereafter The University of North Carolina) as awarding authorities 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 business, minority person, and socially and economically disadvantaged individual - G.S. 143-128 (g) includes the following definitions. Any changes to G.S. 143-128 (g) are incorporated herein upon enactment:
  - (1) The term "minority business" means a business:
    - a. In which at least fifty-one percent (51%) is owned by one or more minority persons or socially and economically disadvantaged individuals, 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.
  - (2) The term "minority person" means 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, or the Pacific Islands;
    - d. American Indian, that is, a person having origins in any of the original Indian peoples of North America; or
    - e. Female.
  - (3) The term "socially and economically disadvantaged individual" means the same as defined in 15 U.S.C. 637.
2. Public Entity – The State of North Carolina and all public subdivisions and local governmental units.
3. Owner - The State of North Carolina, through the constituent institution named in the contract.

4. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.
5. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
6. 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.
7. 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.
8. Subcontractor - A firm under contract with the prime contractor, construction manager at risk, design-builder, or private developer under public-private partnerships 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 University of North Carolina 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. The University of North Carolina System Office: The University of North Carolina System Office will be responsible for the following:

- a. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal prior to award of construction contracts within their awarding authority. The State through The University of North Carolina, reserves the right to reject any or all bids and to waive informalities.
  - b. Assisting constituent institutions in monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
  - c. Consulting and advising institutions and affiliates regarding changes in HUB statutes, executive orders, or state procedures.
  - d. Resolving any protest and disputes arising on projects within The University of North Carolina System Office award authority.
3. Constituent Institutions and Affiliates of The University of North Carolina: Before awarding a contract, the constituent institution shall do the following:
- a. Implement The University of North Carolina HUB plan.
  - 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 its efforts 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 University of North Carolina.
  - g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to University of North Carolina.
  - h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
  - i. Document evidence of implementation of Owner's responsibilities.
4. Designer  
Under the single-prime bidding, separate prime bidding, construction manager at risk, design-build, public-private partnership, 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), including the 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.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by The University of North Carolina System Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, Design-Builder, Public-Private Partnership developer and Its First-Tier Subcontractors: Under all construction delivery 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. 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. 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.
- 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 Subcontractor responsibilities available for review by the University of North Carolina System 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 B) indicating bidder’s 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) and has all material and supplies required for the project. Bidder may be asked to provide additional documentation in support of the claim of self-performance and regarding the Good Faith Effort to utilize minority suppliers where possible. (2) 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; (3) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal (Affidavit D). 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 for formal contracts (>\$500,000) as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) on formal contracts (>\$500,000) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review. This documentation is also required for contracts under informal bidding, but these projects, typically of shorter duration, may have a single payment request at project completion.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, The University of North Carolina System 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 that these requirements apply to all contractors and first tier subcontractor under any of the approved construction delivery methods permitted 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 D: 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 E: EFFECTIVE DATE**

These guidelines shall apply upon promulgation on university construction projects. Copies of these guidelines may be obtained from The University of North Carolina System Office  
website:<https://www.northcarolina.edu/offices-and-services/finance-and-administration/capital-design-and-construction/>.

#### **SECTION F: FORMS**

In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing MBE participation in State, through The University of North Carolina, building projects. An explanation of the process follows, titled "MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)" along with relevant forms for its implementation ("Identification of Minority Business Participation" form, Affidavits A, B, C, D, and Appendix E).

## MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

### APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in University of North Carolina 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 University of North Carolina System Office website: <https://www.northcarolina.edu/offices-and-services/finance-and-administration/capital-design-and-construction/>

### MINORITY BUSINESS SUBCONTRACT GOALS:

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

The bidder must identify on its bid (by using the "Identification of Minority Business Participation" form provided in the bid document), 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).

**Failure to submit these documents is grounds for rejection of the bid. Bid amounts from rejected bids shall not be read aloud at public bid openings.**

**The lowest responsible, responsive bidder must provide:**

**Affidavit C**, if the portion of work to be performed by minority firms is equal to or greater than 10% of the bidder's total contract price. Affidavit C includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, and lists the participating minority firms with the dollar value of their contracts.

**OR**

**Affidavit D**, if the portion of work to be performed by minority firms is less than 10% of the bidder's total contract price. Affidavit D includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, lists the participating minority firms with the dollar value of their contracts, and must include adequate **documentation of Good Faith Effort**.

**AND**

**Affidavit B** (with bid), if the bidder does not customarily subcontract work on this type project and has all material and supplies required for the project. Bidder may be asked to provide additional documentation in support of the claim of self-performance and regarding the Good Faith Effort to utilize minority suppliers where possible.

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

**Summary of required submissions:** Use check boxes to assist in ensuring that all appropriate forms are submitted.

**ALL BIDDERS MUST SUBMIT TWO FORMS WITH THEIR BID:**

- “Identification of Minority Business Participation” form

**AND EITHER**

- Affidavit A – “Listing of Good Faith Efforts”

**OR**

- Affidavit B – “Intent to Perform Contract with Own Workforce”

**The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid. Bid amounts from rejected bids shall not be read aloud at public bid openings.**

=====

**IN ADDITION, THE APPARENT LOWEST RESPONSIVE, RESPONSIBLE BIDDER SUBMITS:**

- Affidavit C** – “Portion of the Work to be Performed by Minority Firms” if the percentage of work to be performed by minority firms is 10% or more. This form is to be submitted within 72 calendar hours of notification of being low bidder.

**OR**

- Affidavit D** – “Good Faith Efforts” if the percentage of work to be performed by minority firms is less than 10%. This form is to be submitted within 72 calendar hours of notification of being low bidder.

**The above information is mandatory. 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 (The University of North Carolina) 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 (The University of North Carolina) 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 (The University of North Carolina) whether to terminate the contract for breach.

In determining whether a contractor has made a Good Faith Effort, the University of North Carolina 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 were 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.



### Identification of HUB Certified/ Minority Business Participation

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

this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers, or providers of professional services.

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

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

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

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

Attach to bid (as appropriate)

Attach to bid (as appropriate)

Attach to bid(as appropriate)

# AFFIDAVIT A

## Listing of Good Faith Efforts

(The University of North Carolina)

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

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

(Name of Bidder)

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.

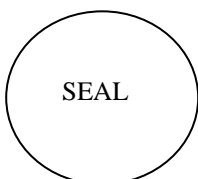
The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

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 \_\_\_\_\_

Attach to bid (as appropriate)

Attach to bid (as appropriate)

Attach to bid (as appropriate)

**AFFIDAVIT B**  
**Intent to Perform Contract with Own Workforce**  
(The University of North Carolina)

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.

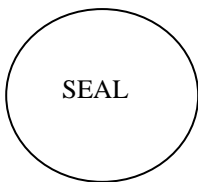
The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

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 \_\_\_\_\_

Do not submit with bid

Do not submit with bid

Do not submit with bid

Do not submit with bid

### AFFIDAVIT C

## Portion of the Work to be Performed by HUB Certified/Minority Businesses (The University of North Carolina)

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 bidder's 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.

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

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

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

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	Work Description	Dollar Value
		Y / N		
		Y / N		
		Y / N		
		Y / N		
		Y / N		
		Y / N		

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

\*\* HUB Certification with the State HUB Office is 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.

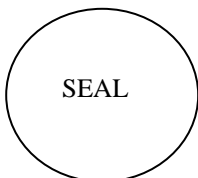
The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

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 \_\_\_\_\_

**AFFIDAVIT D**  
**Good Faith Efforts**  
(The University of North Carolina)

This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low 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:

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

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 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	Work Description	Dollar Value
		Y / N		
		Y / N		
		Y / N		
		Y / N		
		Y / N		

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

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

**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.

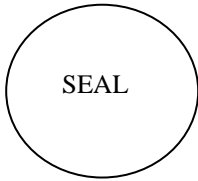
The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

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 \_\_\_\_\_

**\*\*THIS DOCUMENT MUST BE SUBMITTED WITH EACH PAY REQUEST & FINAL PAYMENT\*\***

**APPENDIX E  
MBE DOCUMENTATION FOR CONTRACT PAYMENTS**

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

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

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

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

The following is a list of payments to be made to minority business contractors on this project for the above-mentioned period.

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

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

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

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

Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

Signature certifies that any minority firms not previously verified in the bid/award process have been appropriately verified, services have been rendered, and payment is due as processed.



November 11, 2024

NC State University  
Design and Construction  
NC State's Requirements

### FORM OF PROPOSAL

COE Growth – Research Lab Renovation – Fitz-Woolard Hall	Contract: _____
North Carolina State University	Bidder: _____
SCO # 24-27636-01	Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder proposes and agrees if this proposal is accepted to contract with the State of North Carolina through North Carolina State University in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

This project entails interior lab renovations within 3 work areas totaling 4,000 sq. ft. The renovation includes demolition, architectural, mechanical, plumbing, electrical, and fire protection scope changes. There is no structural or exterior envelope scope. The building will remain occupied during construction. This scope is to create additional lab work areas for the users and will not change the occupancy or occupant load of the existing building.

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the State of North Carolina, North Carolina State University, and BSA LifeStructures with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

#### SINGLE PRIME CONTRACT:

Base Bid: \_\_\_\_\_ Dollars(\$)

General Subcontractor:	Plumbing Subcontractor:
_____ Lic _____	_____ Lic _____
Mechanical Subcontractor:	Electrical Subcontractor:
_____ Lic _____	_____ Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.





**ALTERNATES:**

---

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" or "deducted from" the base bid. (Strike out "Add" or "Deduct" as appropriate.)

GENERAL CONTRACT:

Preferred Brand Alternate No. PB-1 Electrified Door Hardware

(Add) \_\_\_\_\_ Dollars(\$)

Preferred Brand Alternate No. PB-2 Mechanical Door Hardware

(Add) \_\_\_\_\_ Dollars(\$)

Preferred Brand Alternate No. PB-3 Building HVAC Controls

(Add) \_\_\_\_\_ Dollars(\$)

Preferred Brand Alternate No. PB-6 Energy Management

(Add) \_\_\_\_\_ Dollars(\$)

Alternate No. 1 *Baffles*

(Add) \_\_\_\_\_ Dollars(\$)



November 11, 2024

**NC State University**  
Design and Construction  
NC State's Requirements

**UNIT PRICES:**

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

**GENERAL CONTRACT:**

No. 1 (Brief Description) (Unit) Unit Price (\$) \_\_\_\_\_

**PLUMBING CONTRACT:**

No. 1 (Brief Description) (Unit) Unit Price (\$) \_\_\_\_\_

**HVAC CONTRACT:**

No. 1 (Brief Description) (Unit) Unit Price (\$) \_\_\_\_\_

**ELECTRICAL CONTRACT:**

No. 1 (Brief Description) (Unit) Unit Price (\$) \_\_\_\_\_

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 23. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 23.



## **MINORITY BUSINESS PARTICIPATION REQUIREMENTS:**

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Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

**NOTE:** A contractor that performs all of the work with its own workforce may submit an Affidavit (**B**) to that effect in lieu of Affidavit (**A**) required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An 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 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

\* OR \*

If less than the 10% goal, Affidavit (D) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

**Note:** Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.



November 11, 2024

**NC State University**  
Design and Construction  
NC State's Requirements

**Proposal Signature Page**

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The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of \_\_\_\_\_

\_\_\_\_\_  
(Name of firm or corporation making bid)

WITNESS:  
  
\_\_\_\_\_  
(Proprietorship or Partnership)

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

Name: \_\_\_\_\_  
Print or type

Title: \_\_\_\_\_  
(Owner/Partner/Pres./V.Pres)

Address \_\_\_\_\_

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

License No. \_\_\_\_\_

Federal I.D. No. \_\_\_\_\_

Email Address: \_\_\_\_\_

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 \_\_\_\_\_ Addendum No. 3 \_\_\_\_\_ Addendum No. 5 \_\_\_\_\_ Addendum No. 6 \_\_\_\_\_

Addendum No. 2 \_\_\_\_\_ Addendum No. 4 \_\_\_\_\_ Addendum No. 6 \_\_\_\_\_ Addendum No. 7 \_\_\_\_\_

**FORM OF CONSTRUCTION CONTRACT**

(ALL PRIME CONTRACTS)

THIS AGREEMENT, made the \_\_\_\_\_ day of \_\_\_\_\_ in the year of 20\_\_ by \_\_\_\_\_ and \_\_\_\_\_ between \_\_\_\_\_

hereinafter called the Party of the First Part and the State of North Carolina, through the \_\_\_\_\_

\_\_\_\_\_ hereinafter called the Party of the Second Part.

**WITNESSETH:**

That the Party of the First Part and the Party of the Second Part for the consideration herein named agree as follows:

1. Scope of Work: The Party of the First Part shall furnish and deliver all of the materials, and perform all of the work in the manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part thereof as if fully contained herein: advertisement; Instructions to Bidders; General Conditions; Supplementary General Conditions; specifications; accepted proposal; contract; performance bond; payment bond; power of attorney; workmen's compensation; public liability; property damage and builder's risk insurance certificates; approval of attorney general; certificate by the Office of State Budget and Management, and drawings, titled:

\_\_\_\_\_  
\_\_\_\_\_

Consisting of the following sheets:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dated: \_\_\_\_\_ and the following addenda:

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_ Addendum No. \_\_\_\_\_ Dated: \_\_\_\_\_

2. That the Party of the First Part shall commence work to be performed under this agreement on a date to be specified in a written order of the Party of the Second Part and shall fully complete all work hereunder within \_\_\_\_\_ consecutive calendar days from said date. For each day in excess thereof, liquidated damages shall be as stated in

Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

3. The Party of the Second Part hereby agrees to pay to the Party of the First Part for the faithful performance of this agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States as follows:

---

(\$ \_\_\_\_\_).

Summary of Contract Award:

4. In accordance with Article 31 and Article 32 of the General Conditions of the Contract, the Party of the Second Part shall review, and if approved, process the Party of the First Party's pay request within 30 days upon receipt from the Designer. The Party of the Second Part, after reviewing and approving said pay request, shall make payments to the Party of the First Part on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the First Party, less five percent (5%) of the amount of such estimate which is to be retained by the Second Party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the Second Party. The Second Party may elect to waive retainage requirements after 50 percent of the work has been satisfactorily completed on schedule as referred to in Article 31 of the General Conditions.

5. Upon submission by the First Party of evidence satisfactory to the Second Party that all payrolls, material bills and other costs incurred by the First Party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within thirty (30) days after the completion by the First Party of all work covered by this agreement and the acceptance of such work by the Second Party.

6. It is further mutually agreed between the parties hereto that if at any time after the execution of this agreement and the surety bonds hereto attached for its faithful performance, the Second Party shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the First Party shall, at its expense, within five (5) days after the receipt of notice from the Second Party so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Second Party. In such event no further payment to the First Party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Second Party.

7. The Party of the First Part attest that it and all of its subcontractors have fully complied with all requirements of NCGS 64 Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the day and date first above written in \_\_\_\_\_ counterparts, each of which shall without proof or accounting for other counterparts, be deemed an original contract.

Witness:

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

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

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

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

Attest: (Corporation)

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

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

The State of North Carolina through\*

(CORPORATE SEAL)

\_\_\_\_\_  
(Agency, Department or Institution)

Witness:

\_\_\_\_\_

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

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

**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: \_\_\_\_\_



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

Attest: (Corporation)

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

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

(Corporate Seal)

Witness:

\_\_\_\_\_

Countersigned:

\_\_\_\_\_

\_\_\_\_\_  
(N.C. Licensed Resident Agent)

\_\_\_\_\_

\_\_\_\_\_  
Name and Address-Surety Agency

\_\_\_\_\_

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

Contractor: (Trade or Corporate Name)

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

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

\_\_\_\_\_  
(Surety Company)

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

Title: \_\_\_\_\_  
(Attorney in Fact)

(Surety Corporate Seal)

**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)

Witness:

\_\_\_\_\_

Countersigned:

\_\_\_\_\_

\_\_\_\_\_  
(N.C. Licensed Resident Agent)

\_\_\_\_\_

\_\_\_\_\_  
Name and Address-Surety Agency

\_\_\_\_\_

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

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

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

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

\_\_\_\_\_  
(Surety Company)

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

Title: \_\_\_\_\_  
(Attorney in Fact)

(Surety Corporate Seal)

# 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

## Designer Waste Information Form

Project Name:		
Project Designer:		Date:
This form is to be completed by the designer and included with SD documents. Waste Management Plan will be based off of this form.		
Waste Type (Condition of waste can determine category. Damaged Universal Waste can become Hazardous Waste)	Present at Site (Y/N)	Comments
<b>Hazardous Waste and Material</b>		
Asbestos		
Chemical Waste (liquid and solid)		
Lead Containing Paint/ Lead Based Paint Chips/ Lead Debris		
PCB containing items (ballasts, caulk, etc.)		
Mercury contaminated debris/ piping/ P-traps		
Broken fluorescent lamps		
<b>Universal Waste</b>		
Mercury containing items (batteries, switches, etc.)		
Batteries (all types)		
Fluorescent Lamps - Intact		
<b>Non-Regulated Waste</b>		
Drywall		
Insulation		
Broad loom carpet		
Vinyl composition tile		
Acoustic ceiling tile		
Treated wood and MDF		
<b>Other Regulated Waste</b>		
Refrigeration equipment		
Tires		
<b>Recyclable</b>		
White goods (lab refrigerators to be disposed of)		
Roofing materials (asphalt, shingles, gravel, metal) non-ACM or lead		
Oil		
Metal (fixtures, piping, ductwork, studs, wiring)		
Cardboard		
Untreated wood		
Aggregate, concrete, brick, asphalt		
Carpet tile		
Non-PCB ballasts		



Email completed form to EH&S Hazardous Waste Program Manager (mdlong3@ncsu.edu) and Waste Diversion Coordinator, ajbensle@ncsu.edu

<b>Waste Type (Condition of waste can determine category. Damaged Universal Waste can become Hazardous Waste)</b>	<b>Present at Site (Y/N)</b>	<b>Destination for Reuse (Same or different project, Surplus, etc.)</b>
<b>Salvagable</b>		
Furniture		
Fixtures		
Electronic equipment		
Doors		
Windows		
Cabinets		
Shelves		
Sinks, water fountains, etc.		
Dry erase boards, chalkboards, cork boards		
Brick pavers		
Other...		

Email completed form to EH&S Hazardous Waste Program Manager (mdlong3@ncsu.edu) and Waste Diversion Coordinator, ajbensle@ncsu.edu



# SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

PROJECT: \_\_\_\_\_ FROM (CONTRACTOR): \_\_\_\_\_

TO (A/E): \_\_\_\_\_ DATE: \_\_\_\_\_

A/E PROJECT NUMBER: \_\_\_\_\_ CONTRACT FOR: \_\_\_\_\_

LIST SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS PROPOSED FOR USE ON THIS PROJECT AS REQUIRED BY THE CONSTRUCTION DOCUMENTS. ATTACH SUPPLEMENTAL SHEETS IF NECESSARY.

NUMBER SECTION	SECTION TITLE	FIRM	ADDRESS	PHONE NUMBER	CONTACT

Attachments

SIGNED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

COPIES:  Owner  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File

# REQUEST FOR INFORMATION



<b>PROJECT:</b> _____	<b>R.F.I. NUMBER:</b> _____
_____	<b>FROM:</b> _____
<b>TO:</b> _____	<b>DATE:</b> _____
_____	<b>A/E PROJECT NUMBER:</b> _____
<b>RE:</b> _____	<b>CONTRACT FOR:</b> _____

This Clarification Notice is issued for the purpose of clarifying the Contract Documents based on an interpretation reasonably inferable from the Contract Documents, and therefore has no effect on the Contract Sum or Contract Time. Proceeding with Work in accordance with this Clarification Notice indicates acceptance with no change in the Contract Sum or Contract Time.

<b>SPECIFICATION SECTION:</b>	<b>PARAGRAPH:</b>	<b>DRAWING REFERENCE:</b>	<b>DETAIL:</b>
_____			

**REQUEST:**

**SIGNED BY:**

**DATE:**

**RESPONSE:**

Attachments

<b>RESPONSE FROM:</b>	<b>TO:</b>	<b>DATE REC'D:</b>	<b>DATE RET'D:</b>
_____			

**SIGNED BY:**

**DATE:**

**COPIES:**  Owner  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File

# REQUEST FOR INFORMATION LOG



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

A/E PROJECT NUMBER: \_\_\_\_\_

OWNER: \_\_\_\_\_

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

R.F.I. NO.	DATE REC'D	BRIEF DESCRIPTION OF INFORMATION REQUESTED	DATE OF RESPONSE	R.F.P. NO.



<b>Project Name:</b> <b>NC State Project Number:</b> <b>SCO Project Number:</b>					<b>Substitution Request Number:</b> _____					
SPECIFICATION TITLE: _____  Section: _____ Page: _____				DESCRIPTION: _____  Article/Paragraph: _____						
PROPOSED SUBSTITUTION: _____										
MANUFACTURER: _____			ADDRESS: _____				PHONE: _____			
TRADE NAME: _____						MODEL NO.: _____				
INSTALLER: _____			ADDRESS: _____				PHONE: _____			
HISTORY :	<input type="radio"/> New Products			<input type="radio"/> 1-4 years old			<input type="radio"/> 5-10 years old		<input type="radio"/> Over 10 years old	
DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT: _____ _____ _____ <input type="radio"/> Point-by-point comparison data attached										
REASON FOR NOT PROVIDING SPECIFIED ITEM: _____ _____ _____										
SIMILAR INSTALLATION										
PROJECT: _____ ADDRESS: _____ _____						ARCHITECT: _____ OWNER: _____				
WILL PROPOSED SUBSTITUTION AFFECTS OTHER PARTS OF WORK? Yes or No If yes, please explain. _____										



Project Name: \_\_\_\_\_  
 NC State Project Number: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
 SCO Project Number: \_\_\_\_\_

SAVINGS TO OWNER FOR ACCEPTING SUBSTITUTION: \_\_\_\_\_

WILL PROPOSED SUBSTITUTION CHANGE CONTRACT TIME? Yes or No If yes, please explain.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Supporting data attached		<input type="radio"/> Drawings	<input type="radio"/> Product Data
<input type="radio"/> Samples	<input type="radio"/> Tests	<input type="radio"/> Reports	<input type="radio"/> _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 Firm: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Contact number: \_\_\_\_\_

**A/E's REVIEW AND RECOMMENDATION**

- Approve substitution – Make submittals in accordance with Specification Section 01-33-00 Submittal Procedures
- Approve substitution as noted – Make submittals in accordance with Specification Section 01-33-00 Submittal Procedures
- Reject substitution – Use specified materials
- Substitution Request received too late – Use specified materials



<b>Project Name:</b> <b>NC State Project Number:</b> <b>SCO Project Number:</b>	<b>Substitution Request Number:</b> _____
---	---

Signed by:	Date:
------------	-------

**OWNER'S REVIEW AND ACTION**

- Substitution approved – Make submittals in accordance with Specification Section 01-33-00 Submittal Procedures. Prepare change order.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01-33-00 Submittal Procedures. Prepare change order.
- Substitution rejected – Use specified materials

Signed by:	Date:
------------	-------

Additional Comments Attached	
------------------------------	--

<input type="radio"/> Contractor	<input type="radio"/> Subcontractor	<input type="radio"/> Supplier	<input type="radio"/> Manufacturer	<input type="radio"/> A/E
----------------------------------	-------------------------------------	--------------------------------	------------------------------------	---------------------------

Change Order Request #

**Contractor's Change Order Request Summary (Sheet "A")**

Item: \_\_\_\_\_ Code: \_\_\_\_\_ N.C.S.U. Project # \_\_\_\_\_

(Project Name)

Company name Street Address City, State Zip
---

(Line 17.) on sheet "B"

<b>C.O.R. Request Total*</b>	<b>\$</b>	<b>-</b>
<small>* <b>Do Not</b> Round Off Numbers</small>		

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

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

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

|  
|  
|  
|



**Contractor Summary - (Sheet "B")**

	<b>C.O.R. #</b>	
Project Name NCSU Project # SCO # Code:                      Item:		

**Summary of Contractor's Self Performed Work**

(1.) (= line e. from Sheet "C").	Total Material*	\$ -
(2.) (=Line e. from Sheet "D").	Total Labor*	\$ -
(3.) (= line e. from Sheet "E").	Total Equipment*	\$ -
<b>(4.) (=lines 1 + 2 + 3) Total of Self Performed Work* \$ -</b>		

**Summary of Quoted Work (subcontractors)**

(5.)	Quote - Subcontractor #1 (company name)	Quote #1 Total* (without General Contractor OH&P)	\$ -
(6.)	Quote - Subcontractor #2 (company name)	Quote #2 Total* (without General Contractor OH&P)	\$ -
(7.)	Quote - Subcontractor #3 (company name)	Quote #3 Total* (without General Contractor OH&P)	\$ -
(8.)	Quote - Subcontractor #4 (company name)	Quote #4 Total* (without General Contractor OH&P)	\$ -

(9.) (lines 5 + 6 + 7 + 8)	<b>Subtotal - Quoted (subcontract) Work* (w/o Gen Contractor OH&amp;P)</b>	<b>\$ -</b>
----------------------------	--	-------------

(10.) (on line 9.)	5% max (or as negotiated) <input style="width: 50px;" type="text"/> %OH&P	\$ -
--------------------	---	------

(11.) (lines 9 + 10)	<b>Total Quoted (subcontractor) Work (with Gen Contractor OH&amp;P)</b>	<b>\$ -</b>
----------------------	---	-------------

(13.) (lines 4 + 11)	<b>Total All Work* (without bond and ins)</b>	<b>\$ -</b>
----------------------	---	-------------

(14.) (on line 13.)	<input style="width: 50px;" type="text"/> %Bond*	\$ -
---------------------	--	------

(15.) (on line 13)	<input style="width: 50px;" type="text"/> % Ins.*	\$ -
--------------------	---	------

(16.) (lines 14 + 15)	Bonds & Insurance*	\$ -
-----------------------	--------------------	------

(17.) (lines 13 + 16)	<b>Grand Total All Work*</b>	<b>\$ -</b>
-----------------------	------------------------------	-------------

**\* Do Not Round Off Numbers**

## Material Break Down - (Sheet "C")

Material Description	Quantity	Unit	Price	Unit	Extension*
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		ea.	@	\$ - /	ea. = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		lin. feet	@	\$ - /	lin. foot = \$ -
		sq. yds	@	\$ - /	sq. yd = \$ -
		sq. yds	@	\$ - /	sq. yd = \$ -
		sq. yds	@	\$ - /	sq. yd = \$ -
		sq. yds	@	\$ - /	sq. yd = \$ -
		cu. yds.	@	\$ - /	cu. yd. = \$ -
		cu. yds.	@	\$ - /	cu. yd. = \$ -
		cu. yds.	@	\$ - /	cu. yd. = \$ -
		tons	@	\$ - /	ton = \$ -
		tons	@	\$ - /	ton = \$ -
		gals	@	\$ - /	gal = \$ -
		gals	@	\$ - /	gal = \$ -
		gals	@	\$ - /	gal = \$ -
		a. Total Materials*		\$	-
(on line a.)		b.	%	Sales Tax	\$ -
(lines a. + b.)		c.		Subtotal*	\$ -
(on line c.) - max 10% (or as negotiated)		d.	%	O.H.&P.	\$ -
(lines c. + d.)		e.		<b>Total Material*</b>	<b>\$ -</b>

\* Do Not Round Off Numbers

## Labor Break Down (Sheet "D")

Labor Description	Time	Unit	Cost	Unit	Extension*
Foreman	_____	/hr	@ \$ -	/hr	= \$ -
Tradesman	_____	/hr	@ \$ -	/hr	= \$ -
Tradesman	_____	/hr	@ \$ -	/hr	= \$ -
Tradesman	_____	/hr	@ \$ -	/hr	= \$ -
Tradesman	_____	/hr	@ \$ -	/hr	= \$ -
Tradesman	_____	/hr	@ \$ -	/hr	= \$ -
Journey Man	_____	/hr	@ \$ -	/hr	= \$ -
Journey Man	_____	/hr	@ \$ -	/hr	= \$ -
Journey Man	_____	/hr	@ \$ -	/hr	= \$ -
Journey Man	_____	/hr	@ \$ -	/hr	= \$ -
Journey Man	_____	/hr	@ \$ -	/hr	= \$ -
Laborer	_____	/hr	@ \$ -	/hr	= \$ -
Laborer	_____	/hr	@ \$ -	/hr	= \$ -
Laborer	_____	/hr	@ \$ -	/hr	= \$ -
Laborer	_____	/hr	@ \$ -	/hr	= \$ -
Apprentice	_____	/hr	@ \$ -	/hr	= \$ -
Apprentice	_____	/hr	@ \$ -	/hr	= \$ -
Apprentice	_____	/hr	@ \$ -	/hr	= \$ -
Apprentice	_____	/hr	@ \$ -	/hr	= \$ -
(a.) Subtotal Labor*					\$ -
(on Line a.) max 30%	(b.) _____	%	Burden	\$	-
(lines a. + b.) (c.)					Subtotal* \$ -
(on Line c.) max 10% (or as negotiated)	(d.) _____	%	O.H.&P.	\$	-
(lines c. + d.) (e.) Total Labor					\$ -

\* Do Not Round Off Numbers

## Equipment Break Down (Sheet "E")

Equipment Type	Rental Per Hour		Rental Per Day		Rental Per Week		Extension*
	# Hour(s)	Charge	# Day(s)	Charge	# Week(s)	Charge	
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
	hr(s)	@ \$ -   /hr	day(s)	@ \$ -   /day	wk(s)	@ \$ -   /wk(s)	\$ -
						a. Subtotal Equipment*	\$ -
(No sales tax charge on contractor owned equipment)			(on line a.)		b.     %	Sales Tax	\$ -
			(lines a. + b.)		c.	Subtotal*	\$ -
maximun 10% (or as negotiated)			(on Line c.)		d.     %	O.H.&P.	\$ -
						e. Total Equipment*	\$ -

\* Do Not Round Off Numbers

## Change Order Minority Participation

Code /Item:	Code: XXXXX Item:XXX
NCSU Project #:	072044
Contractor:	XXXXXXXXXXXXXX
C.O. Number	<b>G-X</b>
C.O. Scope of Work:	XXXXXXXXXXXXXX
C.O. Cost:	

HUB Subcontractor	Minority Category <sup>1</sup>	Contractor Trade <sup>2</sup>	C.O. Dollar Value	Revised Contract Total
	N/A	N/A	N/A	N/A

<sup>1</sup> Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Economically & Socially Disadvantaged (D)

<sup>2</sup> Contractor Trade - Select number (i.e. "2" for General - Demolition)

<b>Contractor Trades</b>			
1. Div 1 – General Contractor	55. Div 6 – Wood & Plastics – Architectural Woodwork	5. Div 10 – Specialties – Fire Extinguishers and Cabinets	24. Div 15A – Plumbing – Pipe & Pipe Fittings
2. Div 1 – General – Demolition	56. Div 6 – Wood & Plastics – Carpentry	6. Div 10 – Specialties – Identification Devices (Signage, etc.)	25. Div 15A – Plumbing – Pipe Insulation
3. Div 1 – General – Cleaning	57. Div 7 – Thermal/Moisture Protection – Building Insulation	7. Div 10 – Specialties – Toilet Accessories	26. Div 15B – Mechanical – Controls Work
4. Div 1 – General – Temp Facilities (fencing, trailers, etc)	58. Div 7 – Thermal/Moisture Protection – Fireproofing	8. Div 10 – Specialties – Toilet Partitions	27. Div 15B – Mechanical – Ductwork
40. Div 2 – Site Work – Grading	59. Div 7 – Thermal/Moisture Protection – Joint Sealing/Caulking	9. Div 11 – Equipment – Audio-visual (Projectors, Screens, etc.)	28. Div 15B – Mechanical – Mechanical Equipment
41. Div 2 – Site Work – Hauling	60. Div 7 – Thermal/Moisture Protection – Roofing	10. Div 11 – Equipment – Food Service	29. Div 15B – Mechanical – Pipe Duct Insulation
42. Div 2 – Site Work – Landscaping (seeding, planting, etc.)	61. Div 7 – Thermal/Moisture Protection – Waterproofing	11. Div 11 – Equipment – Residential	30. Div 15B – Mechanical – Pipe & Pipe Fittings
43. Div 2 – Site Work – Paving	62. Div 8 – Doors/Windows – Doors	12. Div 12 – Furnishings – Floor Mats	31. Div 15B – Mechanical/HVAC General
44. Div 2 – Site Work – Soil/Sediment Erosion & Control	63. Div 8 – Doors/Windows – Finish Hardware	13. Div 12 – Furnishings – Systems Furniture	32. Div 16 – Electrical – High/Medium Voltage (Transformers, Switches, etc.)
45. Div 2 – Site Work – Water/Sewer System	64. Div 8 – Doors/Windows – Glass & Glazing	14. Div 12 – Furnishings – Window Treatments	33. Div 16 – Electrical – Conduit
46. Div 3 – Concrete – Plain Concrete (sidewalks, curb & gutter, etc.)	65. Div 8 – Doors/Windows – Windows	15. Div 13 – Special Construction – Fire Protection (Sprinklers, etc.)	34. Div 16 – Electrical – Fire Alarm & Smoke Detection Systems
47. Div 3 – Concrete – Pre-cast Concrete	66. Div 9 – Finishes – Acoustic Panel Ceilings	16. Div 13 – Special Construction – Hazardous Materials Abatement	35. Div 16 – Electrical – General
48. Div 3 – Concrete – Structural Concrete	67. Div 9 – Finishes – Carpet	17. Div 13 – Special Construction – Security Systems	36. Div 16 – Electrical – Lighting Fixtures
49. Div 4 – Masonry – General	68. Div 9 – Finishes – Gypsum Drywall	18. Div 14 – Conveying Systems – Elevators	37. Div 16 – Electrical – Site Lighting
50. Div 4 – Masonry – Labor Only	69. Div 9 – Finishes – Hard Flooring (tiles, slate, etc.)	19. Div 14 – Conveying Systems – Escalators	38. Div 16 – Electrical – Telecommunications Systems
51. Div 5 – Metals – Architectural Metal (railings, etc.)	70. Div 9 – Finishes – Painting/Wallcoverings	20. Div 15A – Plumbing – Exterior Work	39. Div 16 – Electrical – Wiring & Wiring Devices
52. Div 5 – Metals – Light Gauge Metal (decking, etc.)	71. Div 9 – Finishes – Plaster	21. Div 15A – Plumbing – Fixtures	
53. Div 5 – Metals – Structural Steel	72. Div 9 – Finishes – Soft tile Flooring	22. Div 15A – Plumbing – Fuel Gas Piping & Equipment	
54. Div 5 – Metals – Structural Steel Erection	73. Div 9 – Finishes – Wood Flooring	23. Div 15A – Plumbing – General	

# State Construction Office

Field Order # \_\_\_\_\_

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

Location: \_\_\_\_\_

Project ID: \_\_\_\_\_

Description of Change: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Justification of Change: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CONTRACTOR:**

A total cost change not to exceed a lump sum cost is \$ \_\_\_\_\_ or a unit cost of \_\_\_\_\_ extended using estimated quantities to not exceed is \$ \_\_\_\_\_. The contractor will need a maximum number of \_\_\_\_\_ days time extension to the contract. The actual cost, not to exceed stated cost, shall be based on a realistic estimate based on current acceptable market values submitted with change order for approval by designer, owner, and State Construction Office.

**DESIGNER:**

The quoted price and need for the change are in the best interests of the owner to have the work accomplished. A formal change order will be prepared for contractor's signature within seven (7) days.

**OWNING AGENCY:**

The owning agency agrees to the change as being in the owner's best interest. Adequate funds are available to pay the cost for the change.

**STATE CONSTRUCTION OFFICE:**

The State Construction Office approves the request for the change.

**SIGNATURES:**

Contractor: \_\_\_\_\_

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

Designer: \_\_\_\_\_

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

Owning Agency: \_\_\_\_\_

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

State Construction Office: \_\_\_\_\_

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



June 14, 2024

NC State University  
Design and Construction  
NC State's Requirements

### Request for Designers Pre-Final Inspection Checklist

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

NC State Project Number: \_\_\_\_\_

NC State Code / Item: \_\_\_\_\_

SCO Project Number: \_\_\_\_\_

All items must be complete and verified by the Designer. Once items are verified as complete, Designer shall note the date complete and initial the line. If items are not applicable to the project, Designer shall note "N/A" in the date line.

Item	Date	Initials
Contractors Statement of Completion with Request for Designers Inspection, include Contractors Completion List		
Initial Submission of the TAB Report		
Pre-Functional Testing Report		
Operation & Maintenance Submittal Log showing all required O&M's have been approved		
Schedule of Owner Trainings		
Certification all Fire Extinguishers have been installed or delivered to N.C. State		
Demonstration of the operation of fire pumps to the N.C. State Fire Marshall		
Final Clean is Complete		
Laboratory Hood Certification by Contractors 3rd Party Inspector (if applicable)		
Roof & Window Water Test Reports (if applicable)		

Designers Approval: \_\_\_\_\_  
Name Signature Date



June 14, 2024

NC State University  
Design and Construction  
NC State's Requirements

### Request for Final Inspection Checklist

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

NC State Project Number: \_\_\_\_\_

NC State Code / Item: \_\_\_\_\_

SCO Project Number: \_\_\_\_\_

All items must be complete and verified by the Designer. Once items are verified as complete, Designer shall note the date complete and initial the line. If items are not applicable to the project, Designer shall note "N/A" in the date line.

\_\_\_\_\_ (Designer of Record) provides information to the Owner and the State Construction Office that the project has been evaluated and field inspected to assure Life Safety Construction involving Fire Protection Systems (Fire Alarm, Sprinkler, etc.), egress, fire rated walls, and egress travel distances are constructed in accordance with the Contract Documents for Final Inspection to allow occupancy by the Owner.

\_\_\_\_\_  
Designer's Representative

Item	Date	Initials
Contractors Statement of Completion with Request for Designers Inspection, include Contractors Completion List		
Designer's Pre-Final Punch List Inspection		
SCO Final Inspection Scheduled for _____		
SCO Electrical Inspection (Certificate of Electrical Completion)		
Installer's Fire Alarm System Record of Completion (Certification) as required by NFPA 72		
Installers Sprinkler System Material & Test Reports:		
NFPA 13 (Sprinkler Systems)		
NFPA 14 (Standpipe & Hose Systems)		
NFPA 20 (Centrifugal Fire Pumps)		
NFPA 22 (Water Tanks for Private Fire Protection)		
NFPA 24 (Private Fire Service Mains)		
SCO Approval Letter for Sprinkler System		
Engineer's Approval of Battery Powered Emergency Devices		
Engineer's Approval Emergency and Standby Generator NFPA 110 Tests		
Engineer's Approval Electrical Service Ground Test Report		
Department of Labor Approval for Elevator		
Department of Labor Approval for Boiler & Pressure Vessels		
Department of Agriculture Approval for Fuel Tanks		





June 14, 2024

**NC State University**  
Design and Construction  
NC State's Requirements

Item	Date	Initials
Health Department Inspection and Acceptance for Use		
Domestic Water Test Report and Acceptance for Use		
Laboratory Hood Certification by Contractors 3 <sup>rd</sup> Party Inspector		
Laboratory Hood Certification by N.C. State EH&S		
Engineers Approval of Test & Balance Report		
Engineers Verification Letter of Fire Damper Operation		
Backflow Preventer Certification		
Designers Approval of Stair / Ramp Survey		
Metal Building Manufacturer's Warranty		
Roofing Manufacturer's Warranty		
Commissioning Agents Approval		
Lightning Protection UL Master Label		
Special Inspectors Final Report / Resolutions		
Designer's Approval of Site Survey		

Designers Approval: \_\_\_\_\_  
Name
Signature
Date

NCSU Approval: \_\_\_\_\_  
Name
Signature
Date



North Carolina  
State Construction Office

**PROJECT APPROVAL AUTHORIZATION**  
**PARTIAL UTILIZATION: (BENEFICIAL OCCUPANCY)**

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

SCO Identification Number: \_\_\_\_\_ Contract Completion Date: \_\_\_\_\_

Project Owning Agency: \_\_\_\_\_

Owning Agency's Requester: \_\_\_\_\_ Date: \_\_\_\_\_

Designer's Statement:

\_\_\_\_\_ (Designer's Firm Name) provides information to the owner and the State Construction Office that the project has been evaluated and field inspected to assure that construction meets contract requirements for partial utilization and/or occupancy by the owning agency.

\_\_\_\_\_  
Designer's Representative Name

Project Description: \_\_\_\_\_

Project Partial Utilization Description: \_\_\_\_\_

**BACK-UP DATA:**  
**CONTRACTOR'S APPROVAL DOCUMENTS:**

General Construction Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Electrical Construction Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Mechanical Construction Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Plumbing Construction Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Sprinkler Installation Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Asbestos Removal Contractor's Approval:	Date _____	N/A <input type="checkbox"/>
Other: _____	Date _____	N/A <input type="checkbox"/>
Other: _____	Date _____	N/A <input type="checkbox"/>
Other: _____	Date _____	N/A <input type="checkbox"/>
Certificate of Occupancy by Local Authority Having Jurisdiction (Community College):	Date _____	N/A <input type="checkbox"/>



**North Carolina  
State Construction Office**

Beneficial Occupancy Inspection:	Date _____	N/A <input type="checkbox"/>
Beneficial Occupancy Punch List to be completed:	Date _____	N/A <input type="checkbox"/>
Owner's Assumption of Responsibility for Maintenance, Heat, Utilities, and Insurance: Comments: _____	Date _____	N/A <input type="checkbox"/>
Established Date for Guarantees and Warranties. Comments: _____	Date _____	N/A <input type="checkbox"/>
Consent of Surety:	Date _____	N/A <input type="checkbox"/>
Insurance Company Permitting Occupancy:	Date _____	N/A <input type="checkbox"/>
SCO Electrical Inspection (Certificate of Electrical Completion):	Date _____	N/A <input type="checkbox"/>
Installer's Fire Alarm System Record of Completion (Certification) as required by NFPA 72:	Date _____	N/A <input type="checkbox"/>
Installer's Sprinkler System Material and Test Reports as required by:		
NFPA 13-(Sprinkler Systems)	Date _____	N/A <input type="checkbox"/>
NFPA 14-(Standpipe and Hose Systems)	Date _____	N/A <input type="checkbox"/>
NFPA 20-(Centrifugal Fire Pumps)	Date _____	N/A <input type="checkbox"/>
NFPA 22-(Water Tanks for Private Fire Protection)	Date _____	N/A <input type="checkbox"/>
NFPA 24-(Private Fire Service Mains)	Date _____	N/A <input type="checkbox"/>
Other: SCO Approval Letter Sprinkler System	Date _____	N/A <input type="checkbox"/>
Engineer's Approval of Battery Powered Emergency Devices:	Date _____	N/A <input type="checkbox"/>
Engineer's Approval Emergency and Standby Generator NFPA 110 Tests:	Date _____	N/A <input type="checkbox"/>
Engineer's Approval Electrical Serv Ground Test Report:	Date _____	N/A <input type="checkbox"/>
Dept. of Labor Approval for Elevator:	Date _____	N/A <input type="checkbox"/>
Dept. of Labor Approval for Boiler & Pressure Vessels:	Date _____	N/A <input type="checkbox"/>
Dept. of Agriculture Approval for Fuel Tanks:	Date _____	N/A <input type="checkbox"/>
Health Dept. Inspection and Acceptance for Use:	Date _____	N/A <input type="checkbox"/>



**North Carolina  
State Construction Office**

Domestic Water Test Report and Acceptance for Use:	Date _____	N/A <input type="checkbox"/>
Laboratory Hood Certification:	Date _____	N/A <input type="checkbox"/>
Engineer's Approval of Test and Balance Report:	Date _____	N/A <input type="checkbox"/>
Engr's. Verification Letter Fire Damper Operation:	Date _____	N/A <input type="checkbox"/>
Agreement & Means for Separation of Owner Occupied Area from Construction Work Area:	Date _____	N/A <input type="checkbox"/>
Designer's Inspection to Assure Life Safety Construction involving Fire Protection Systems (Fire Alarm, Sprinkler, etc.), egress, fire rated walls and egress travel distances are constructed in accordance with contract documents:	Date _____	N/A <input type="checkbox"/>
Backflow Preventer Certification:	Date _____	N/A <input type="checkbox"/>
Engineer's Approval Stair/Ramp Survey:	Date _____	N/A <input type="checkbox"/>
Engineer's Approval Site Survey (DENR):	Date _____	N/A <input type="checkbox"/>
Metal Building Manufacturer's Warranty:	Date _____	N/A <input type="checkbox"/>
Roofing Manufacturer's Warranty:	Date _____	N/A <input type="checkbox"/>
Commissioning Engineer's Approval:	Date _____	N/A <input type="checkbox"/>
Lightning Protection UL Master Label:	Date _____	N/A <input type="checkbox"/>
Special Inspector's Final Report/Resolutions:	Date _____	N/A <input type="checkbox"/>

Designer's Approval:                      Date: \_\_\_\_\_                      Printed Name: \_\_\_\_\_

Owning Agency Approval:                      Date: \_\_\_\_\_                      Printed Name: \_\_\_\_\_

SCO Approval:                                      Date: \_\_\_\_\_                      Printed Name: \_\_\_\_\_



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### Final Acceptance Checklist

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

NC State Project Number: \_\_\_\_\_

NC State Code / Item: \_\_\_\_\_

SCO Project Number: \_\_\_\_\_

Item	Date	Initials
Signed Request for Final Inspection Checklist		
SCO Beneficial Occupancy Form(s) for Project's Phases		
Designer's statement to Owner the Designer's Punch List has been Completed		
SCO Final Acceptance Inspection		
SCO Final Acceptance Punch List Issued		
Contractors Work Plan for SCO Final Acceptance Punch List		
Owner's Assumption of Responsibility for Maintenance, Heat, Utilities, and Insurance		
Cancellation of Contractors Insurance Carriers Public Liability, Property Damage, and Builders Risk		
Established Date for Guarantees and Warranties		
Insurance Company Permitting Occupancy		
Record of Owner's Trainings: Plumbing HVAC/Controls Electrical Fire Alarm		
NCSU Fire Marshall's inspection of life safety systems (FAS, Sprinkler System, Emergency Generator, Fire Pumps etc)		
NCSU Lock Shop to installed permanent lock cores on Project's doors		

Date of Project's Final Acceptance: \_\_\_\_\_

Designers Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------

NCSU Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------

SCO Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------



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### Project Closeout Checklist

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

NC State Project Number: \_\_\_\_\_

NC State Code / Item: \_\_\_\_\_

SCO Project Number: \_\_\_\_\_

Item	Date	Initials
Signed Request for Final Inspection Checklist		
Signed Final Acceptance Checklist		
Contractors Final Payment Application		
Contractors Affidavit of Release of Leins		
Contractors Affidavit of Payment of Debts & Claims		
Consent of Surety to Final Payment		
Certificates of Compliance – by each Designer who sealed documents		
Certificate of Completion – by Lead Designer		
Complete Tax Statement Form		
MBE Appendix E Form		
Survey of New & Existing Sub-surface Utilities		
All Contractors Keys Returned to Lock Shop		
NCSU Stormwater Program Manager Approval		
SCO Punch List Complete		
List of Contractors & Subcontractors		
As-Builts & Record Documents		

Designers Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------

NCSU Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------

SCO Approval: \_\_\_\_\_

Name	Signature	Date
------	-----------	------

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

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

Page \_\_\_\_\_ 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 \_\_\_\_\_, 19\_\_\_\_

\_\_\_\_\_  
 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 \_\_\_\_ 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.







# FACILITIES DIVISION

## REQUEST FOR UTILITY INTERRUPTION WORK SHEET

### REQUESTOR

NAME : \_\_\_\_\_

DATE : \_\_\_\_\_

DEPT : \_\_\_\_\_

PHONE : \_\_\_\_\_

WORK REQ # : \_\_\_\_\_ ACCT # : \_\_\_\_\_

CAMPUS BOX : \_\_\_\_\_

### BUILDING INFORMATION / DATE & TIME

BUILDING(s) : \_\_\_\_\_

ENTIRE BLDG or  
SPECIFIC ROOM : \_\_\_\_\_

BEGIN DATE : \_\_\_\_\_

END DATE : \_\_\_\_\_

BEGIN TIME : \_\_\_\_\_

END TIME: \_\_\_\_\_

### DISCONNECT INFORMATION

#### **POWER**

Primary

Secondary

#### **RUNNING WATER**

Hot

Cold

Distilled

#### **FIRE ALARM**

Disconnect

Testing

Sprinkler Operational Yes / No

**HEATING**

**STEAM SYSTEMS**

**AIR CONDITIONING**   
(Chilled Water)

**PROPANE/NATURAL GAS**

**OTHER :** \_\_\_\_\_

**For all Fire Alarm / Sprinkler Disconnects or Testing, please first obtain approval from the Electronics Shop: <http://facilities.ofa.ncsu.edu/fire-alarm-disconnect/>(separate form).**

### REASON FOR INTERRUPTION (Scope of Work):

Shop Supervisor Signature: \_\_\_\_\_

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

Addtl. Supervisor (s) Signature: \_\_\_\_\_

### POLICY # 806 – ROUTINE UTILITY INTERRUPTION REQUEST – ADV NOTIFICATION PERIODS

Primary (Total Building) Power – 10 working days

Secondary Power Feeders – 4 working days

Cold/Hot Water Interruption – 4 working days

A/C/Heat Interruption – 4 working days

\*Fire Alarm Disconnect/Testing – 3 working days

Distilled Water Interruption – 3 working days

Steam Interruption – 5 working days

Gas Interruption – 5 working days

Lab Air Interruption – 4 working days

Sanitary/Storm Sewer – 3 working days

**PLEASE NOTE: The Customer Service Center will make notifications for the disconnect if it is submitted within the appropriate number of days. The CSC will also make notifications for Emergency disconnects. If it is not submitted within the appropriate number of days, it is the Requestor's responsibility to make the notifications to all personnel.**

## Method of Procedure

Requested Start Date: DD/MM/YYYY

Requested Work Window: XX hours or YY days

Backup Dates:

1.0 **Purpose / Scope of Work**

1.1 The purpose of this procedure is to [description of the work to be performed].

2.0 **Personnel**

2.1 **Contractors Personnel**

2.1.1 [List Name, Title, and Contact Information for the Contractors Personnel]

2.2 **NC State Personnel**

2.2.1 [List Name, Title, and Contact Information for the Contractors Personnel]

2.3 **Other Personnel**

2.3.1 [List Name, Title, and Contact Information for the Contractors Personnel]

3.0 **Planned Impact to Environment / Equipment**

3.1 [Describe the intended impact of the work].

4.0 **Risks & Potential Hazards**

4.1 [List the risks and potential hazards associated with the work]

5.0 **Stakeholders Impacted**

5.1 [List the stakeholders impacted by the work]

6.0 **Contingency Plan**

6.1 [Describe the contingencies planned by the contractor to mitigate risks associated with the work not going according to plan.]

7.0 **Attachments & References**

7.1 [List the attachments associated with the MOP.]

7.2 [List the reference documents & details associated with the MOP.]

8.0 **Prerequisites**

8.1 [Description of Prerequisite #1.]

Prerequisite #1 is complete.

[ENTITY]:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Date

8.2 [Description of Prerequisite #2.]

9.0 Prerequisite #2 is complete.

[ENTITY]:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Date

PROJECT NAME  
NCSU Project Number  
Building Name: XYZ Hall  
MOP-XXX

10.0 **Procedure**

10.1 [Step 1]

10.2 [Step 2]

10.3 [Step 3]



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**PRECONSTRUCTION MEETING AGENDA**

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

Project number: \_\_\_\_\_ Code: \_\_\_\_\_ Item: \_\_\_\_\_ SCO ID #: \_\_\_\_\_

Date and location of Meeting: \_\_\_\_\_

Attendees:

**1.) Introductions**

**2.) Correspondence Protocol;**

- a. All correspondence shall have the NCSU Project Name and Number as indicated on SCO's letter of award.
- b. Owner and Contractor will endeavor to direct all communications through the Design Representative.
- c. Correspondence from Designer to Owner will be addressed to the NCSU Project Manager.
- d. Correspondence between Designer and Contractor requires copy to the NCSU Project Manager.
- e. Correspondence from Owner and Contractor to Designer will be addressed to the Design Representative.

**3.) Schedule**

- a. Bar chart, Network plots. Project schedule, signed by all major subcontractors, is due to the designer within 30 calendar days of the notice to proceed. A Schedule of Values shall be submitted within 30 calendar days of the notice to proceed.
- b. Monthly schedule updates, signed by all major subcontractors, shall be required with each payment application.
- c. Milestones:

**Notice to Proceed Date:** \_\_\_\_\_

**Project Start Date:** \_\_\_\_\_

**Duration:** \_\_\_\_\_

**Project Completion Date:** \_\_\_\_\_

Adjustment(s) to the completion of a project will only be allowed by a justifiable change order approved by the designer, the owning agency and the State Construction Office.



One copy of the approved schedule is to be posted at the project site and marked daily showing actual progress of the work.

The submission of an approved schedule and schedule of values to the designer shall occur prior to submitting the first request for payment. The schedule of Values shall include dollar value of each subcontractor and shall identify MBE subcontract work.

A list of subcontractors and material suppliers are to be provided to the designer with a copy for the State Construction Office within 14 days of the notice to proceed in accordance with article 16 of the general conditions.

- d. Weather Delays: The general conditions states the contractual method by which the contractors were to use to establish the expected number of weather days to include in the contract(s). For weather impact greater than what is in the contract, the contract is due to be adjusted. The contractors' project administrators should develop a daily log on construction events covering construction progress and daily weather conditions that affect the construction progress. Copies of the logs should be directed to the designer's representative on a weekly basis for his initial. Copies of the logs should be turned in to the designer on a monthly basis with a request for weather time extensions if justifiable. The requests will be evaluated and approved by the designer, owning agency and State Construction Office if deemed valid. The designer shall keep a running total of time of weather relating delays for granting one change order per prime contract at the end of the project for contract adjustment to the date of completion of the project.
- e. Liquidated Damages: The contract contains a clause allowing an assessment of a sum of \_\_\_\_\_ dollars per day as liquidated damages for each calendar day the project construction is delayed beyond the adjusted scheduled completion date.
- f. It is important all prime contractors become familiar with the general and the supplementary general conditions of the contract(s).

**4.) Progress Meetings**

- a. SCO/Owner's/Designer's Regular monthly progress meetings will be held on:

**Location:** \_\_\_\_\_

**Time:** \_\_\_\_\_

Prime contractors shall be represented by office and project representatives having the authority to make bindings contractual decisions on the contract. The meetings are open to subcontractors, material suppliers and others that may contribute to the progress toward project completion. The meetings are to enhance coordination, to enhance cooperation, to assist the support of the project schedule, to facilitate in the resolution of problems, and to review pending changed conditions.

- b. Contractor's regular weekly progress meetings will be held on:

Location: \_\_\_\_\_

Time: \_\_\_\_\_

Meeting Agenda. A sample agenda for these meetings is included in the Project Manual.

**5.) Change Orders**

For Changes in the Work - follow General Conditions Article 19 and see Attachment 2:

- a. Provide breakdown of materials, labor rates, and correct OH&P

- b. Each request will be identified as "change proposal" or "change request" and will be number consecutively.
- c. Designer will prepare field orders to the Contract on State Construction Office forms.
- d. Owner and Designer will prepare change orders to the Contract on State Construction Office forms or using SCO Interscope Website to process electronically.
- e. Designer shall maintain a change order log.
- f. ***Time extension requests must be supported by a marked-up schedule showing the impact of the delay(s) on the critical path.***
- g. The University requires 6 original change orders for processing.
- h. Only the designer has the authority to issue change orders to change the work of Contractor
- i. All User or other departmental requests for changes in the work will be channeled through the N.C.S.U. Project Manager to the designer as necessary.

**6.) Pay Applications/Schedule of Values:**

- a. Shall be submitted on *AIA G702 forms*. Applications submitted on any different format will be returned *NOT APPROVED*. The University requires three originals only.
- b. A copy of *NC Sales Tax Report* shall be included with each pay application.
- c. Contractor will submit pay applications to the Designer for approval.
- d. Submittal date to designer will be: \_\_\_\_\_.
- e. Schedule of values *must be approved by Designer and Owner* prior to first pay application.
- f. Pay applications must clearly identify the type of contract (general, mechanical, plumbing, electrical, etc.). Project name, code and item number, NCSU project number, and SCO ID number must be shown.
- g. All Pay Applications must be accompanied by a *Consent of Surety* and up to date *MBE (HUB) Form*.
- h. Contractor's pay applications are due at Capital Project Management by the fifth of each month.
- i. A copy of the payment application will be submitted to the SCO Project Monitor.

**7.) Project Close-Out:**

The following must all be complete and included:

- a. As-Builts, including registered survey and certification of stairs.
- b. O&M Manuals
- c. Special Inspections Report
- d. Consent of Surety
- e. Affidavit of Payment of Debts and Claims and Lien waivers
- f. Special warranties/bonds, certificates of completion and compliance
- g. Certification of equipment demonstrations and training for Owner personnel.
- h. Commissioning of building systems if required
- i. Contractor and Designer evaluations

**8.) Personnel Conduct**

- a. Zero tolerance for harassment of any sort of any member of the University community.
- b. Smoking Policy - No smoking inside of existing facility or addition.
- c. Protection/Safety
  - 1.) OSHA Regulations:
    - a) Fire control
    - b) Barricades - work areas, excavation, pedestrian access, etc.
    - c) Housekeeping - keep site clean, keep mud off streets daily
  - 2.) Working in and around occupied facilities - must be sensitive to the needs of occupants. Coordinate with Project Manager. Noise hours.
  - 3.) Scheduling of cutting of floors in occupied spaces. Precaution to protect activities in floors below
  - 4.) Hot Work Permits: Fire Marshals Office: 515-2568
  - 5.) Contractors shall familiarize themselves with article 11 of the general conditions. The requirements are a mandatory part of the contract.
- d. Accident Reports - Owner requires copy of First Report of Injury.
- e. It is illegal for any person to have firearms at the project site, any type of alcoholic beverages, or drugs other than prescribed by a physician. Everyone at the project site is expected to exhibit proper behavior. Indecent language, acts or dress will not be accepted. Anyone in violation of proper behavior will be ejected from the construction site by the proper authorities.

**9.) Temporary Services and Facilities:**

- 1.) Sanitary:
  - 2.) Water:
  - 3.) Power:
  - 4.) Heat:
  - 5.) Telephone:
  - 6.) Trailers:
  - 7.) Job Sign:
  - 8.) Parking:
  - 9.) Waste Disposal Dumpster:
  - 10.) Restroom facilities are to be:
- b. Service Continuity:
    - 1.) All interruption of services will be coordinated through the NCSU project manager
    - 2.) Contractor will not interrupt existing services, i.e., Owner will throw switches, turn valves, etc.
    - 3.) 5 days minimum notice, longer for major utility outages, up to 10 days for high voltage or building electricity interruptions.
  - c. Cleaning of Streets - any mud, debris, etc., will be removed by Contractor daily.



- d. Site Considerations:
  - 1.) Project limits and staging - see drawings.
  - 2.) Store materials properly.
  - 3.) Erosion control.
  - 4.) Tree protection.
  - 5.) Concrete wash-down areas - keep clean - do not wash out near trees, storm drain inlets.
  - 6.) Pre-Excavation Process:
    - a) The Contractor shall lay out excavations.
    - b) The Contractor shall be responsible for having existing utilities located.
    - c) The Contractor may start excavation only when all known utilities have been located or verified as per the specifications.

**10.) Special Requirements of the Owner:**

- a. Asbestos:
  - 1.) If applicable, Owner will survey for, and deal with asbestos removal prior to work on this contract commencing.
  - 2.) If the Contractor encounters any material that is suspected to be asbestos, work will cease immediately in the area, and the area will be barricaded, etc.
  - 3.) Owner shall be notified immediately if the presence of asbestos is suspected.
- b. Submittals:
  - 1.) Submit \_\_\_ copies to Designer. NCSU requires one full set of approved submittals at the end of the project.
  - 2.) Submittals to be numbered consecutively and specification section will be referenced.
  - 3.) Contractor approval stamp required prior to submission to the Designer.
  - 4.) Designer shall maintain submittal log.
  - 5.) *See Attachment 3 for a list of Submittals to be reviewed by the owner.*
- c. Requests For Information:
  - 1.) Contractor is responsible for thoroughly reviewing contract documents prior to request for information.
  - 2.) Designer shall maintain a RFI (request for information) log.
- d. Normal working Hours: \_\_\_\_\_

**11.) Final Inspections:**

- a. State Inspections must be complete and approved. (SCO Electrical, NFPA Testing, and DOL: elevator, boilers, pressure vessels, etc.)
- b. Satisfactory review of project completeness by the Designer.
- c. The designer shall coordinate and notify all parties of the time and date of the formal final inspection.

- d. Upon correction by the contractor and verification by the designer that the work has been completed, a formal final inspection shall be coordinated and performed by the designer in cooperation with the contractor in the present of the owning agency and the State Construction Office.

**12.) As-Built Drawing:**

- a. Contractor to keep record set of drawings on site for record drawing purposes exclusively.
- b. Designer and Owner will review the record drawings once a month at construction meeting.

**13.) State Construction Office Requirements:** Show project SCO ID on all correspondence. Provide a copy of all designers' weekly inspection reports to the project monitor.



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**MONTHLY MEETING AGENDA**

Project Name: \_\_\_\_\_  
Project number: \_\_\_\_\_ Code: \_\_\_\_\_ Item: \_\_\_\_\_ SCO ID #: \_\_\_\_\_

Date and location of Meeting: \_\_\_\_\_

Attendees:

- 1.) Review previous minutes of the meeting and resolve any corrections.
- 2.) Work performed in the last 30 days.
- 3.) Work to be performed in the next 30 days.
  - a. Review Project Schedule Summary and attach to the meeting minutes.
  - b. Review updated schedule and attach to the meeting minutes.
  - c. Review Monthly Progress Summary and attach to the meeting minutes.
- 4.) Requests for Proposals.
- 5.) Review Pending Change Orders. Attach an updated Change Order Log to the meeting minutes.
- 6.) Review Requests for Information. Attach an updated RFI log to the meeting minutes.
- 7.) Review Submittals. Attach an updated Submittal Log to the meeting minutes.
- 8.) Discuss Coordination Issues.
- 9.) Designer Weekly Inspection Reports.
- 10.) Erosion Control & Tree Protection Review.
- 11.) Site Cleanliness.
- 12.) Safety.
- 13.) Open Discussion.
- 14.) Attach photos of work progress, taken within two days of the meeting, to the meeting minutes.



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### PROJECT SCHEDULE SUMMARY

Notice to Proceed Date \_\_\_\_\_

Contract Completion Date \_\_\_\_\_

Contract Calendar Days \_\_\_\_\_

Number of Contract Calendar Days Expended to Date  
Thru \_\_/\_\_/\_\_ \_\_\_\_\_

Percentage of Contract Time Expended to Date  
Thru \_\_/\_\_/\_\_ (Days Expended/Contract Duration) \_\_\_\_\_

Previous Percentage of Contract Time Expended to Date \_\_\_\_\_

Pending Time Extensions (Weather – Calendar Days) \_\_\_\_\_

Pending Time Extensions (Scope – Calendar Days) \_\_\_\_\_

Approved Time Extensions (Weather – Calendar Days) \_\_\_\_\_

Approved Time Extensions (Scope – Calendar Days) \_\_\_\_\_

Completion Date per Updated Schedule \_\_\_\_\_

Actual Percentage Complete (Work in Place less stored Materials)  
thru \_\_/\_\_/\_\_ \_\_\_\_\_

Previous Percentage Complete \_\_\_\_\_



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**MONTHLY CONSTRUCTION PROGRESS REPORT**

Designer		Address	
Location		Date	
Job Title		Starting Date	
SCO ID#			

**PERCENT COMPLETION**

	% Previous Month	% This Month	% Total to Date	% Scheduled	Completion Date
General Contract					
Plumbing Contract					
Mechanical Contract					
Electrical Contract					

Change Orders Since Last Report:

Change Order Number	Amount	Purpose

Insurance up to Date:                      Yes \_\_\_                      No \_\_\_  
Explanation (if no):

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Financial Status:	Previously Authorized	Authorized This Month	Total Contract Inc. Extras	% of Total Authorization
General				
Plumbing				
Mechanical				
Electrical				
Totals				

If work is behind schedule, what action has been taken?

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### WEEKLY MEETING AGENDA

Project Name: \_\_\_\_\_  
Project number: \_\_\_\_\_ Code: \_\_\_\_\_ Item: \_\_\_\_\_ SCO ID #: \_\_\_\_\_

Date and location of Meeting: \_\_\_\_\_

Attendees:

- 1.) Contractor's Construction Schedule:
  - a. 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.
  - b. Review schedule for the upcoming two-week period.
  - c. Discuss long-term schedule needs as necessary.
- 2.) Safety, hazards and risks.
- 3.) Change Order Requests and Change Orders.
- 4.) Request for Information.
- 5.) Submittals.
- 6.) Designer Inspection Reports.
- 7.) Erosion & Sedimentation Update (if applicable).
- 8.) Review condition of tree protection (if applicable).
- 9.) Progress cleaning and site cleanliness.
- 10.) Changes to Site Logistics or Emergency Action Plan.
- 11.) Sequence of operations.
- 12.) Resolution of BIM component conflicts.
- 13.) Status of upcoming samples and/or mockups, and location for review.
- 14.) Deliveries.
- 15.) Off-site fabrication.
- 16.) Access.
- 17.) Site utilization.



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- 18.) Temporary facilities and controls.
- 19.) Atypical work hours.
- 20.) Quality and work standards.
- 21.) Pending changes
- 22.) Pending claims and disputes.
- 23.) Documentation of information for payment requests.
- 24.) Testing and inspection requirements.
- 25.) Other business relating to the Work.

# NC State University Lift Plan Approval Request

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

Submitted by: \_\_\_\_\_

NCSU Group Leading Project: \_\_\_\_\_

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

- 
- The identity of the controlling entity, meaning the employer with the overall responsibility for construction operations associated with the crane lift.
  - Identify a lift director (i.e. primary signal person) and method of communication (hand signals, radio, etc.).
  - Contractors conducting crane operations are required to obtain required FAA permits according to 14.CFR Part 77; to be submitted with the lift plan.
  - Equipment positioning locations, including load staging and movement and paths to and from the working position
  - Equipment specifications including load and reach capacities
  - Current qualifications, certifications, and licenses of operator(s) and rigger(s)
  - For lifts involving more than one crane, the lift plan shall encompass all cranes.
  - Fall Zone: The contractor shall identify the Fall Zone. The Fall Zone is the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall. Spaces within the Fall Zone (including buildings, foot traffic, vehicle traffic, etc.) shall be barricaded to control access. The Fall Zone shall be cleared of personnel not participating in the lift.
  - Wind limitations
  - Ground and subsurface stability at crane and load placement locations. The contractor must ensure a qualified person evaluates the crane set-up location to ensure ground conditions are sufficient.
  - Other conditions or factors that may affect the safety of the lift
  - A pre-lift meeting must be completed immediately before the lift and shall include all personnel involved with the lift and a thorough review of the elements and specifics of the lift plan and personnel assignments.
  - Specify distance to closest energized lines and applicable minimum approach distance of any lift component.
  - Where items positioned by a crane lift are rigged at heights above easy reach height, the lift plan shall include safe attachment and de-attachment procedures and the control of exposure to fall hazards
  - The contractor must provide documentation of annual and monthly inspections for the previous 3 months. 1926.1412(f) & .1412(e)

Reviewed by: \_\_\_\_\_

Review Date \_\_\_\_\_

- **Approved**
- **More Information Needed**
- **Denied**





# C&D WASTE AND RECYCLING TRACKING FORM

The University requires 75% of the waste produced from each project be diverted from the landfill

Project Name & ID: \_\_\_\_\_

Name of Contractor: \_\_\_\_\_

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

Contractor Phone #: \_\_\_\_\_

For assistance completing this form contact Adam Bensley, NCSU Waste Reduction & Recycling (919) 515-0661

Name of Person Completing Form: \_\_\_\_\_

**It is required to attach weight tickets and/or invoices to this form.**

Please check one:  Weight tickets attached  Weight tickets not attached. Provide explanation: \_\_\_\_\_

Date	Waste Hauler/Contractor Name	Material Description	Weight (lbs or tons)	Estimate Weight if no Ticket	Recycling or Landfill Facility Hauled to

## Project Totals (Contractor to Calculate)

Total Weight Landfill: \_\_\_\_\_

Total Weight Diverted (Recycled + Salvaged): \_\_\_\_\_

Percent of Project Waste Diverted from Landfill  
(Total Weight Diverted / Total Project Weight) x 100

Total Weight Recycled: \_\_\_\_\_

Total Project Weight (Recycled + Salvaged + Landfilled): \_\_\_\_\_

\_\_\_\_\_ %

**Instructions for completing this form**

1. NCSU project manager to provide info.
2. Contractor to provide this information, including name of person completing this form.
3. Check a box indicating whether weight tickets are attached to this form. If they are not, provide an explanation.
4. Complete one line for each instance of hauling.
  - A. List the date material was hauled.
  - B. Provide name of waste hauler or contractor who disposed or recycled the material.
  - C. List the type of material disposed of or recycled. Ex. Mixed C&D waste, scrap metal, concrete, asphalt shingles, etc.
  - D. List the actual weight of the material, in pounds or tons, as recorded by a scale.
  - E. If material is not weighed by a scale, provide an estimate of the weight in pounds or tons (keep units consistent throughout).
  - F. List the facility the material was delivered to.
5.
  - A. Provide the total weight of all materials that went to a landfill. *Note:* For Waste Industries Raleigh View Road C&D Processing Facility *only* - 20% of each load is recycled. Multiply the weight recorded at this facility by .80 to get the weight landfilled by Waste Industries.
  - B. Provide the total weight of materials that were recycled. *Note:* For Waste Industries Raleigh View Road C&D Processing Facility *only* - 20% of each load is recycled. Multiply the weight recorded at this facility by .20 to get the weight recycled by Waste Industries.
  - C. Total weight recycled (B) plus total weight salvaged (*#8 on Salvaged Material form*).
  - D. Total weight of all material generated by the project (A+B+C).
  - E. Divide the total weight diverted by the total project weight, then multiply by 100 to get the diversion rate as a percent  $((C/D) \times 100)$ .



**C&D WASTE AND RECYCLING TRACKING FORM**

The University requires 75% of the waste produced from each project be diverted from the landfill

1. Project Name & ID: \_\_\_\_\_

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

For assistance completing this form contact Adam Bensley, NCSU Waste Reduction & Recycling (919) 515-0661

2. Name of Contractor: \_\_\_\_\_

Contractor Phone #: \_\_\_\_\_

Name of Person Completing Form: \_\_\_\_\_

**It is required to attach weight tickets and/or invoices to this form.**

3. Please check one:  Weight tickets attached  Weight tickets not attached. Provide explanation: \_\_\_\_\_

4.

Date	Waste Hauler/Contractor Name	Material Description	Weight (lbs or tons)	Estimate Weight if no Ticket	Recycling or Landfill Facility Hauled to
A	B	C	D	E	F

**Project Totals (Contractor to Calculate)**

5. Total Weight Landfill: **A** \_\_\_\_\_ Total Weight Diverted (Recycled + Salvaged): **C** \_\_\_\_\_ Percent of Project Waste Diverted from Landfill (Total Weight Diverted / Total Project Weight) x 100

Total Weight Recycled: **B** \_\_\_\_\_ Total Project Weight (Recycled + Salvaged + Landfilled): **D** \_\_\_\_\_ **E** \_\_\_\_\_%

Description Of Program: The University has established a program to salvage building materials, parts and furnishings that would otherwise be considered construction and demolition waste. Prior to the beginning of construction and renovations projects on campus, Facilities Operations and other Donees will have an opportunity to reclaim C&D materials for reuse.

Facilities Operations Trade shops will have first priority in the invitation to salvage materials from construction and renovation projects. Other donees, such as Habitat for Humanity may receive donation of reusable materials. The following conditions and procedure must be met in order to participate in the salvaged material/ reuse program.

**Criteria:**

Clear understanding of the purpose of the salvaged material/ reuse program.

**Tracking the salvaged materials is extremely important to protect all participants from possible liability claims or false acquisition of materials by shops or donees.**

Shop or donee is responsible for removal and transportation of materials.

Shop or donee has adequate second use or storage for the materials.

Shop or donee takes responsibility for the timely and lawful surplus or disposal of materials if an adequate reuse is not identified in an appropriate amount of time.

**Questions? Contact WRR at 919.515.9421 or [recycling@ncsu.edu](mailto:recycling@ncsu.edu)**

**Return completed form to Waste Reduction and Recycling. Campus Box 7516 or [recycling@ncsu.edu](mailto:recycling@ncsu.edu)**



# CONSTRUCTION & DEMOLITION SALVAGED MATERIAL FORM

Project Name & ID: \_\_\_\_\_

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

For assistance completing this form contact Adam Bensley, NCSU Waste Reduction & Recycling (919) 515-0661

Date	Material Description	Quantity	Weight Each Item (lbs or tons)	Estimated Donation Value	Released By (NCSU)	Released To & Phone #

Total Salvaged Material Weight: \_\_\_\_\_

**Instructions for completing this form**

- 6. NCSU project manager to provide info.
- 7. Complete one line for each item salvaged for reuse.
  - A. List the date salvaged material was turned over to the receiving party.
  - B. Describe the material being salvaged for reuse.
  - C. Quantity of a particular item was salvaged.
  - D. Weight of each item, either actual or estimated.
  - E. Estimate the value of the material. If you are unsure, leave this blank.
  - F. List the name of the person at NCSU who is releasing the material.
  - G. List the name and phone number of the person who is receiving the material.
- 8. Add up the total weight of material salvaged. Keep the units (tons or pounds) consistent with those used on C&D waste tracking form, as this number will be used in the diversion rate equation.



**CONSTRUCTION & DEMOLITION SALVAGED MATERIAL FORM**

6. Project Name & ID: \_\_\_\_\_  
 Project Manager Name: \_\_\_\_\_

For assistance completing this form contact Adam Bensley, NCSU Waste Reduction & Recycling (919) 515-0661

7.

Date	Material Description	Quantity	Weight Each Item (lbs or tons)	Estimated Donation Value	Released By (NCSU)	Released To & Phone #
A	B	C	D	E	F	G

8. Total Salvaged Material Weight: \_\_\_\_\_

## SECTION 006000 – PROJECT FORMS

## PART 1 – GENERAL

## 1.1. GENERAL

- A. Working copies of most Administrative Forms can be provided to Contractor by Owner or Designer upon request.
- B. Related Sections:
  - 1. All HUB Forms for the project can be found in Section 002126 “UNC System MB Guidelines & Forms 2024”.

## 1.2. FORM OF AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner / Contractor Agreement and form of the General Conditions shall be used for Project:
  - 1. Form of Construction Contract as shown in Section 005200 “Form of Construction Contract.”
  - 2. The General Conditions for Project are specified in Section 007200 “General Conditions of the Contract.”
  - 3. Supplementary General Conditions are specified in Section 007300 “Supplementary General Conditions.”

## 1.3. ADMINISTRATIVE FORMS

- A. Copies of AIA standard forms may be obtained from the American Institute of Architects.
- B. Copies of CSI standard forms may be obtained from the Construction Standards Institute.
- C. Preconstruction Forms:
  - 1. Notice to Proceed.
  - 2. Designer Waste Information Form
- D. INFORMATION & MODIFICATION FORMS: Attached at the end of this Section.
  - 1. Subcontractor & Major Material Suppliers List.
  - 2. Requests for Interpretation (RFI).
  - 3. RFI Log.
  - 4. Submittal Transmittal.
  - 5. Substitution Request.
  - 6. Potential Change Order Form.
  - 7. HUB Change Order Form
  - 8. Field Order
  - 9. Request for Designers Pre-Final Inspection Checklist
  - 10. Request for Final Inspection Checklist
  - 11. Final Acceptance Checklist
  - 12. Project Closeout Checklist
  - 13. Bulletin Form or ASI
- E. PAYMENT FORMS:

November 11, 2024

**NC State University**  
Design and Construction  
NC State's Requirements

1. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
2. Sales Tax.
3. Stored Material Summary.

F. OPERATIONS FORMS

1. Method of Procedure Form.
2. Preconstruction Conference Agenda.
3. Designer Monthly Meeting Agenda.
4. Contractor Weekly Meeting Agenda.
5. Crane Lift Plan.
6. C&D Waste and Recycling Tracking Form.
7. Construction & Demolition Salvaged Material Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 006000



**ASI No.:** 001

**Project Name and No.:**

**Contractor:**

**Date Issued:**

**Description:**

Incorporate modifications as follows:

....

This clarification and/or change is intended to supplement and/or modify the contract documents; however, the information presented is presumed to be relatively minor in nature, not requiring a modification of the contract amount or time of completion. Contractor must advise if this assessment is in error in order that the specified procedure for modifying the contract can be implemented. If a response is necessary, please respond within two weeks.



ASI No.: 001

Project:

Page 2 of 2

**Attachments:**

**Issued By:** /

**Copies:** e-file; Docunet

# NOTICE TO PROCEED



**PROJECT:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
\_\_\_\_\_  
**A/E PROJECT NUMBER:** \_\_\_\_\_  
**TO:** \_\_\_\_\_ **CONTRACT FOR:** \_\_\_\_\_  
\_\_\_\_\_

You are hereby notified that the Contract Times stated for the Project will commence on \_\_\_\_\_ .  
On that date, start performing the obligations required by the Contract Documents. (Date)

Before commencing Work at the Project Site, deliver the certificates of insurance to the Owner as required by the Contract Documents.

Also before commencing Work at the Project Site, perform:

**AUTHORIZED BY:** \_\_\_\_\_  
(Owner)  
\_\_\_\_\_  
(Authorized Signature)  
\_\_\_\_\_  
(Title)

**ACCEPTED BY:** \_\_\_\_\_  
(Contractor)  
\_\_\_\_\_  
(Authorized Signature)  
\_\_\_\_\_  
(Title)  
\_\_\_\_\_  
(Date)

Attachments

**DATE:** \_\_\_\_\_

**COPIES:**  Owner  A/E  Consultants  \_\_\_\_\_  \_\_\_\_\_  \_\_\_\_\_  File



# SUBMITTAL COVER SHEET

CONTRACTOR:

DATE: \_\_\_\_\_

TO:

BSA LifeStructures  
120 S. Central Ave., Suite 1100  
St. Louis, MO 63105  
FAX: 314-754-6306

RE:

<u>Spec Section</u>	<u>Description</u>	<u>No. of Pages</u>
<u>Contractor Stamp</u>	<u>A/E Review / Action</u> Checked only for compliance with design concept of Contract Documents. Contractor shall be responsible for compliance with requirements of Contract Documents, quantities, dimensional suitability for installation, coordination with other trades, and performing work in a safe, workmanlike and satisfactory manner.  <b>BSA</b>  <u>Action / Date / Reviewer</u>	

**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 Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; 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 through the agency named in the contract.
- c. The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.
- d. The **contractor**, as referred to hereinafter, shall be deemed to be either of the several contracting parties called the "Party of the First Part" in either of the several contracts in connection with the total project. Where, in special instances hereinafter, a particular contractor is intended, an adjective precedes the word "contractor," as "general," "heating," etc. For the purposes of a single prime contract, the term Contractor shall be deemed to be the single contracting entity identified as the "Party of the First Part" in the single Construction Contract. Any references or adjectives that name or infer multiple prime contractors shall be interpreted to mean the single prime Contractor.
- e. A **subcontractor**, as the term is used herein, shall be understood to be one who has entered into a direct contract with a contractor, 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.
- h. The **project** is the total construction work to be performed under the contract documents by the several contractors.
- i. **Project Expediter**, as used herein, is an entity stated in the contract documents, designated to effectively facilitate scheduling and coordination of work activities. See Article 14(f) for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime contractor shall be designated as the Project Expediter.**
- j. **Change order**, as used herein, shall mean a written order to the contractor subsequent to the signing of the contract authorizing a change in the contract. The change order shall be signed by the contractor, 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 contractor to proceed with the work requested by owner prior to issuance of a formal Change Order. The field order shall be signed by the contractor, designer, owner, and State Construction Office.
- l. **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).
- m. **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 contractor(s) 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 contractor, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused solely by the Contractor (e.g., if a multi-phased project-subsequent phases, delays in start other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).
- n. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the contractor, and which engages to be responsible for the contractor and his acceptable performance of the work.
- o. **Routine written communications between the Designer and the Contractor** 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 can not be identified as "request for information".
- p. **Clarification or Request for information (RFI)** is a request from the Contractor 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 Contractor's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.
- q. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work.
- r. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.
- s. **"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 Designer and owner.
- t. **"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.



- u. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.
- v. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.
- w. **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.
- x. **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.
- y. **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.
- z. **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.
- aa. **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.
- bb. 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, and 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 bid for 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 contractor shall execute each copy of the proposal, 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 contractor'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 contractor's signature on the performance bond and the payment bond shall correspond with that on the contract. The date of performance and payment bond shall not be prior to the date of 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 contractor(s) 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 contractor 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 contractors electronic copies of plans and specifications. If requested by the contractor, paper copies of plans and specifications shall be furnished free of charge as follows:

- a. General contractor - Up to twelve (12) sets of general contractor drawings and specifications, up to six (6) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

- b. Each other contractor - Up to six (6) sets of the appropriate drawings and specifications, up to three (3) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.
- c. Additional sets shall be furnished at cost, including mailing, to the contractor upon request by the contractor. This cost shall be stated in the bidding documents.
- d. For the purposes of a single-prime contract, the contractor shall receive up to 30 sets of drawings and specifications, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

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

- a. Within 15 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for submission of all shop drawings, product data, samples, and similar submittals through the Project Expediter 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 Contractor(s) 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 Contractor'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 Contractor. 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 or of separate Contractors.
- 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 Contractor not later than twenty (20) days from the date of receipt by the Designer, for the Contractor'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/submittals by the Designer shall not be construed as relieving the Contractor 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 lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

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

- a. The contractor 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, his authorized representative, owner or State Construction Office.

- b. The contractor 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 contractor and submitted to the designer upon project completion and no later than 30 days after final 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 contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.
- b. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.
- c. Upon notice, the contractor shall furnish evidence as to quality of materials.
- d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.
- e. 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 language, conduct, or attire 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 contractor 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 contractor shall protect and save harmless the owner against suit on account of alleged or actual infringement. The contractor 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 contractor 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 contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the designer in writing. See Instructions to Bidders, Paragraph 3, Bulletins and Addenda. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising therefrom. 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 contractor and included within the bid proposal. All water taps, meter barrels, vaults and impact fees shall be paid by the contractor unless otherwise noted.
- d. 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 contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.
- e. Projects involving local funding (community colleges) are subject also to county and municipal building codes and inspection by local authorities. The contractor shall pay the cost of these permits and inspections.

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

- a. The contractors shall be jointly 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. They 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. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times.
- b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.
- c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.
- d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.
- e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.
- f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.
- g. The contractor 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 emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage.

Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 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 contractor(s) 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 contractor(s) 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 contractor(s) 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 contractor(s) 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 and during any time work is in preparation and progress 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 contractor shall therefore provide safe access to the work at all times for such inspections.
- b. All instructions to the contractor 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 contractor.
- c. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. Contractor shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first reinspection all costs associated with additional reinspections shall be borne by the contractor.

- d. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.
- e. All laboratory tests shall be paid by the owner unless provided otherwise in the contract documents except the general contractor 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.
- f. Should any work be covered up or concealed prior to inspection and approval by the designer, special inspector, and/or State Construction Office such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. 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 contractor involved.

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

- a. Throughout the progress of the work, each contractor shall keep at the job site, a competent superintendent and supervisory staff satisfactory to the designer and the owner. The superintendent and supervisory staff shall not be changed without the consent of the designer and owner unless said superintendent ceases to be employed by the contractor or ceases to be competent as determined by the contractor, designer or owner. The superintendent and other staff designated by the contractor in writing shall have authority to act on behalf of the contractor, and instructions, directions or notices given to him shall be as binding as if given to the contractor. However, directions, instructions, and notices shall be confirmed in writing.
- b. The contractor 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. All contractors shall be required to cooperate and consult with each other during the construction of this project. Prior to installation of work, all contractors shall jointly prepare coordination drawings, showing locations of various ductworks, piping, motors, pumps, and other mechanical or electrical equipment, in relation to the structure, walls and ceilings. These drawings shall be submitted to the designer through the Project Expediter for information only. Each contractor shall lay out and execute his work to cause the least delay to other contractors. Each contractor shall be financially responsible for any damage to other contractor's work and for undue delay caused to other contractors on the project.
- d. The contractor is required to attend job site progress conferences as called by the designer. The contractor shall be represented at these job progress conferences by both home office and project personnel. These representatives shall have authority to act on behalf of the contractor. These meetings shall be open to subcontractors, material



suppliers and any others 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. Each contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman. The contractor 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.

- e. The contractor(s) 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 in a location where same will not be disturbed and where direct instruments sights may be taken.
- f. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be designated in the Supplementary General Conditions. The Project Expediter shall have at a minimum the following responsibilities.
  - 1. Prepare the project construction schedule and shall allow all prime contractors (multi-prime contract) and subcontractors (single-prime contract) performing general, plumbing, HVAC, and electrical work equal input into the preparation of the initial construction schedule.
  - 2. Maintain a project progress schedule for all contractors.
  - 3. Give adequate notice to all contractors to ensure efficient continuity of all phases of the work.
  - 4. Notify the designer of any changes in the project schedule.
  - 5. Recommend to the owner whether payment to a contractor shall be approved.
- g. It shall be the responsibility of the Project Expediter to cooperate with and obtain from several prime contractors and subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A “work activity”, for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill. The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the contractor’s early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order. On a multi-prime project, each prime contractor shall review the proposed construction schedule and approve same in writing. The Project Expediter shall submit the proposed construction schedule to the designer for comments. The complete Project construction schedule shall be of the type set forth in the Supplementary General Condition or subparagraph (1) or (2) below, as appropriate:

1. For a project with total contracts of \$500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the work.
2. For a project with total contracts over \$500,000, a Critical Path Method (CPM) schedule shall be utilized to control the planning and scheduling of the Work. The CPM schedule shall be the responsibility of the Project Expediter and shall be paid for by the Project Expediter.

**Bar Chart Schedule:** Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submission of shop drawings and other Submittals for approval, approval of shop drawings by designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

**CPM Schedule:** Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s).. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over \$2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

**Early Completion of Project:** The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time

for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

- h. The proposed project construction schedule shall be presented to the designer no later than fifteen (15) days after written notice to proceed. No application for payment will be processed until this schedule is accepted by the designer and owner.
- i. The approved project construction schedule shall be distributed to all contractors and displayed at the job site by the Project Expediter.
- j. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the project construction schedule, making biweekly adjustments, updates, corrections, etc., that are necessary to finish the project within the Contract time, keeping all contractors and the designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the designer, along with monthly request for payment. For project requiring CPM schedule, the Contractor shall submit a biweekly report of the status of all activities. The bar chart schedule or status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the work of several contractors are behind schedule, the contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the designer by the Project Expediter, when (1) the contractor's report indicates delays, that are in the opinion of the designer or the owner, of sufficient magnitude that the contractor's ability to complete the work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions, as determined by the Designer, are in process; and (3) the contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the designer or the owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment applications or withholding of funds as set forth in Article 33.
- k. The Project Expediter shall notify each contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the contractor(s) responsible for such delay, the designer, the State Construction Office and other prime contractors. The designer shall determine the contractor(s) who caused the delays and notify the bonding company of the responsible contractor(s) of the delays; and shall make a recommendation to the owner regarding further action.
- l. Designation as Project Expediter entails an additional project control responsibility and does not alter in any way the responsibility of the contractor so designated, nor the

responsibility of the other contractors involved in the project. The project expeditor's Superintendent(s) shall be in attendance at the Project site at all times when work is in progress unless conditions are beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such Superintendent shall be acceptable to the Owner and Designer and shall be the one who will be continued in that capacity for the duration of the project unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The Superintendent shall not be employed on any other project for or by the Contractor or by any other entity during the course of the Work. If the Superintendent is employed by the Contractor on another project without the Owner's approval, then the Owner may deduct from the Contractor's monthly general condition costs and amount representing the Superintendent's cost and shall deduct that amount for each month thereafter until the Contractor has the Superintendent back on the Owner's Project full-time.

#### **ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS**

- a. Effective from January 1, 2002, Chapter 143, Article 8, was amended, to allow public contracts to be delivered by the following delivery methods: single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The owner reserves the right to prepare separate specifications, receive separate bids, and award separate contracts for such other major items of work as may be in the best interest of the State. For the purposes of a single prime contract, refer to Article 1 – Definitions.
- b. All contractors shall cooperate with each other in the execution of their work, and shall plan their work in such manner as to avoid conflicting schedules or delay of the work. See Article 14, Construction Supervision.
- c. If any part of contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the designer in order that prompt inspection may be made and the defects corrected. Commencement of work by a contractor where such condition exists will constitute acceptance of the other contractor's work as being satisfactory in all respects to receive the work commenced, except as to defects which may later develop. The designer shall be the judge as to the quality of work and shall settle all disputes on the matter between contractors.
- d. Any mechanical or electrical work such as sleeves, inserts, chases, openings, penetrations, etc., which is located in the work of the general contractor shall be built in by the general contractor. The respective mechanical and electrical contractors shall set all sleeves, inserts and other devices that are to be incorporated into the structure in cooperation and under the supervision of the general contractor. The responsibility for the exact location of such items shall be that of the mechanical and/or electrical contractor.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress and during normal working hours. The contractor shall provide facilities for such access so the designer may perform his functions under the contract documents.
- f. Should a contractor cause damage to the work or property of another contractor, he shall be directly responsible, and upon notice, shall promptly settle the claim or otherwise resolve the dispute.

#### **ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS**

- a. Within thirty (30) days after award of the contract, the contractor shall submit to the designer, owner and to the State Construction Office a list giving the names and addresses of subcontractors and equipment and material suppliers he proposes to use, together with the scope of their respective parts of the work. Should any subcontractor be disapproved by the designer or owner, the designer or owner shall submit his reasons for disapproval in writing to the State Construction Office for its consideration with a copy to the contractor. If the State Construction Office concurs with the designer's or owner's recommendation, the contractor shall submit a substitute for approval. The designer and owner shall act promptly in the approval of subcontractors, and when approval of the list is given, no changes of subcontractors will be permitted except for cause or reason considered justifiable by the designer or owner.
- b. The designer will furnish to any subcontractor, upon request, evidence regarding amounts of money paid to the contractor on account of the subcontractor's work.
- c. The contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.
- d. The owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

## **ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS**

The contractor agrees that the terms of these contract documents shall apply equally to each subcontractor as to the contractor, and the contractor agrees to take such action as may be necessary to bind each subcontractor to these terms. The contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to contractor-subcontractor relationships, and that payments to subcontractors shall be made in accordance with the provisions of 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 G.S. 136-28.1, the balance due prime contractors 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 contractor, 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. No payment shall be delayed because of the failure of another prime contractor on such project to complete his contract. Should final payment to any prime contractor beyond the date such contracts have been certified to be completed by the designer or architect, 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 prime contractor 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 a prime contractor during construction shall be paid in accordance with the payment provisions of the contract documents or said prime contractor 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 prime contractor of each periodic or final payment, the prime contractor shall pay the subcontractor based on work completed or service provided under the subcontract. Should any periodic or final payment to the subcontractor be delayed by more than seven days after receipt of periodic or final payment by the prime contractor, the prime contractor shall pay the subcontractor 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 prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the owner to the prime contractor. Any percentage of retainage on payments made by the prime contractor to the subcontractor that exceeds the percentage of retainage on payments made by the owner to the prime contractor shall be subject to interest to be paid by the prime contractor to the subcontractor at the rate of one percent (1%) per month or fraction thereof.
- d. Nothing in this section shall prevent the prime contractor at the time of application and certification to the owner from withholding application and certification to the owner for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment and materials; damage to prime contractor or another subcontractor; reasonable evidence that subcontract 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 designer shall provide general administration of the performance of construction contracts, including 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 direct work to be performed, to stop work, to order work removed, or to order corrections of faulty work, where any such action by the designer may be necessary to assure successful completion of the work.
- b. The 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 contractor, taking sides with neither.
- c. Should the 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 designer.

- d. The designer and his consultants will make inspections of the project. He will inspect the progress, the quality and the quantity of the work.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress during normal working hours. The contractor shall provide facilities for such access so the designer and owner may perform their functions under the contract documents.
- f. Based on the designer's inspections and evaluations of the project, the designer shall issue interpretations, directives and decisions as may be necessary to administer the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract.

## **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 contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.
- b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order 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, electronically, 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.

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

- c. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:
  - 1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, Owner and State Construction Office 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 shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1<sup>st</sup> tier subs), or their sub-subcontractors (2<sup>nd</sup> tier subs, 3<sup>rd</sup> tier subs, etc)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1<sup>st</sup> tier sub; 1<sup>st</sup> tier, 2<sup>nd</sup> tier, 3<sup>rd</sup> tier, etc contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; 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 work;
  2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.
  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 work;
  5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the work.

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 unit cost breakdown showing method of arriving at net cost as defined above.
- g. In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer, the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to



the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order 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. 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 contractor shall be required to certify as follows:

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

- 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 contractor's terms are unacceptable, the owner, with the approval of the State Construction Office, may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. 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 contractor consider that as a result of instructions given 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 contractor 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 shall 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 contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor 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 contractor and is denied by the designer or owner, and cannot be resolved by a

representative of the State Construction Office, the contractor may request a mediation in connection with GS 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 contractor is unable to resolve its claim as a result of mediation, the contractor may pursue the claim in accordance with the provisions of G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner, and the following:

1. A contractor who has not completed a contract with a board 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 contractor 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 Chapter 150B of the General Statutes.
2. (a) A contractor who has completed a contract with a board 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 contractor claims is due. The claim shall be submitted within sixty (60) days after the contractor 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 contractor agree. The contractor 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 contractor a written statement of the director's decision on the contractor's claim.
  - (c) A contractor 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 contractor 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 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 contractor.

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

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the owner and the designer, the owner shall be reimbursed by the contractor. 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 time of completion is stated in the Supplementary General Conditions and in the Form of Construction Contract. The Project Expediter, upon notice of award of contract, shall prepare a construction schedule to complete the project within the time of completion as required by Article 14.
- b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the designer and shall fully complete all work hereunder within the time of completion stated. Time is of the essence and the contractor acknowledges the Owner will likely suffer financial damage for failure to complete the work within the time of completion. For each day in excess of the above number of days, the contractor(s) shall pay the owner the sum stated as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of said contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.
- c. In the event of multiple prime contractors, the designer shall be the judge as to the division of responsibility between the contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.
- d. If the contractor is delayed at any time in the progress of his work solely by any act or negligence of the owner, the designer, or by any employee of either; by any separate contractor employed by the owner; 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 only 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 contractor 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.

- e. 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 Contractor shall notify the Designer to the designer, copies to the owner and SCO, of the delay within 20 days of the beginning of the delay and only one claim is necessary.
- f. The contractor shall notify his surety in writing of extension of time granted.
- g. No claim for time extension shall be allowed on account of failure of the 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 prior to the completion of the project.
- 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.
  - 2. Contractor will obtain consent of surety.
  - 3. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.
- c. The owner shall have the right to exclude the contractor from any part of the project which the designer has so certified to be substantially complete, but the owner will allow the contractor 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 contractor 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 contractor(s) that the project is complete and ready for inspection, the 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 contractor(s) shall complete all items requiring corrective measures noted at the Designer

final inspection. The designer shall schedule a SCO final inspection at a time and date acceptable to the owner, contractor(s) and 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 one of the following determinations:
  - 1. That the project is completed and accepted.
  - 2. That the project will be 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.
  - 4. That the project is not complete and another date for a SCO final inspection will be established.
- c. Within fourteen (14) days of final acceptance per Paragraph b1 or within fourteen (14) days after completion of punch list per Paragraph b2 above, the 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 b1 or b2 above shall be handled in accordance with Article 42, Guarantee.
- f. The final acceptance date will establish the following:
  - 1. The beginning of guarantees and warranties period.
  - 2. The date on which the contractor'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 contractor.
- g. **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 contractor, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the owner. Work or property of other contractors or the owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the contractor whose work is faulty.

- b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the designer, and shall make satisfactory progress, as determined by the designer, until completed.
- c. Should the contractor 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 designer, shall relieve the contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. Contractor shall correct or make good any defects due thereto and repair any damage resulting there from, 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 contractor and establish a time limit for completion of corrections by the contractor. 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 contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

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

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time 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 contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety of such delay, neglect or default, specifying the same, and if the contractor 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 contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and provisions thereof

or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said contractor and surety. In case the expense so incurred by the owner shall be less than the sum which would have been payable under the contract, if it had been completed by said contractor, then the said contractor and surety shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the contractor and the surety shall be liable and shall pay to the owner the amount of said excess.

### **ARTICLE 30 - CONTRACTOR'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 contractor, 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 contractor, 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 contractor for the cost of all materials delivered and work performed on this contract plus 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 contractor 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 contractor 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 contractor'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. The contractor, upon request of the designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.
- c. Prior to submitting the first request, the contractor shall prepare for the designer a schedule showing a breakdown of the contract price into values of the various parts of the work, so arranged as to facilitate payments to subcontractors in accordance with Article 17, Contractor and Subcontractor Relationships. The contractor(s) shall list the

value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

- d. 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 contractor 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 contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the contractor 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 contractor'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 contractor. 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 contractor(s).
- e. In the event of beneficial occupancy, retainage of funds due the contractor(s) 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 contractor's bonding company.

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

- a. Within five (5) days from receipt of request for payment from the contractor, 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 contractor 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 contractor.
  - 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 contractor 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 contractor 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 contractor 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 contract amounts and total actual payments to subs and material suppliers.
  2. Affidavit of Release of Liens.
  3. Affidavit of contractors 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 designer, certificates of compliance issued, and the contractor has complied with the closeout requirements. The designer shall forward the contractor’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.
- b. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:
    1. Claims filed against the contractor or evidence that a claim will be filed.
    2. Evidence that subcontractors have not been paid.
  - c. The Owner may withhold all or a portion of Contractor's general conditions costs set forth in the approved schedule of values, if Contractor 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 contractor without cause will make owner liable for payment of interest to the contractor 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 contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

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

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

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

The contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor, or by

anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

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

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

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

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

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

**d. Deductible**

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

**e. Other Insurance**

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

**f. Proof of Carriage**

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

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

- a. Each contractor shall furnish a performance bond and payment bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications.
- 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 contractor on account of the contract shall not become due until the contractor 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 in connection with his contract have been satisfied, and that no claims or

liens exist against the contractor in connection with this contract. In the event that the contractor cannot obtain similar affidavits from subcontractors to protect the contractor and the owner from possible liens or claims against the subcontractor, the contractor shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the contractor's) knowledge, and if any appear afterward, the contractor shall save the owner harmless.

#### **ARTICLE 37 - ASSIGNMENTS**

The contractor 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 contractor under the contract may be assigned.

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

- a. The contractor(s) 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 owner and shall not exceed those established limits in his operations.
- b. The contractor(s) shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- c. The contractor(s) 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 contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts 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 contractor shall endanger any work of another contractor by cutting, digging or other means. No contractor shall cut or alter the work of any other contractor without the consent of the designer and the affected contractor(s).

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

- a. The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer and other utility services which maybe necessary and required for completion of the project including all utilities required for testing, cleaning, balancing, and sterilization of designated plumbing, mechanical and electrical systems. Any permanent meters installed shall be listed in the contractor's name until work has a final acceptance. The contractor will be solely responsible for all utility costs prior to final acceptance. Contractor shall contact all affected utility companies prior to bid to determine their requirements to provide temporary and permanent service and include all costs associated with providing those services in their bid. Coordination of the work of the utility companies during construction is the sole responsibility of the contractor.

- b. Meters shall be relisted in the owner's name on the day following final acceptance of the Project Expediter's work, and the owner shall pay for services used after that date.
- c. The owner shall be reimbursed for all metered utility charges after the meter is relisted in the owner's name and prior to completion and acceptance of the work of **all** contractors. Reimbursement shall be made by the contractor whose work has not been completed and accepted. If the work of two or more contractors has not been completed and accepted, reimbursement to the owner shall be paid by the contractors involved on the basis of assessments by the designer.
- d. Prior to the operation of permanent systems, the Project Expediter will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.
- e. All contractors shall have the permanent building systems 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 contractor(s), the designer and owner. Use of the equipment in this manner shall be subject to the approval of the Designer and owner and shall in no way affect the warranty requirements of the contractor(s).
- f. The electrical contractor shall have the building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.
- g. The electrical contractor shall have the building's permanent lighting system ready at the time the general contractor begins interior painting and shall provide adequate lighting in those areas where interior painting and finishing is being performed.
- h. Each prime contractor 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 final acceptance of work by the State Construction Office, each contractor shall remove and replace 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 electrical contractor shall have all lamps in proper working condition at the time of final project acceptance.
  - i. The Project Expediter 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.
  - j. The Project Expediter 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.
  - k. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.
  - l. The Project Expediter 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 names of prime contractors on the project, 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 contractors shall keep the building and surrounding area 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 or Project Expediter. The Project Expediter shall provide an on site refuse container(s) for the use of all contractors. Each contractor shall remove their rubbish and debris from the building on a daily basis. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.
- b. The Project Expediter shall provide and maintain suitable all-weather access to the building.
- c. Before final inspection and acceptance of the building, each contractor shall clean his portion of the work, 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 contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the 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 contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.
- c. Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.
- d. Guarantees for 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 contractor 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 there from, and (2) is caused in whole or in part by any negligent act or omission of the contractor, the contractor's subcontractor, or the agents of either the contractor or the contractor'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 and contract sum.
- e. **Accounting Procedures for Refund of County Sales & Use Tax**

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

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

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

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 contractor.

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

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

#### **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.



Contractors are reminded of the requirements of instructions under Instructions to Bidders and 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**

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix E are hereby incorporated into and made a part of this contract.

#### **ARTICLE 50 – CONTRACTOR EVALUATION**

The contractor'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 bid on future State capital improvement projects. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, *Contractor Evaluation Procedures*, is hereby incorporated and made a part of this contract. The owner may request the contractor'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 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, 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**

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

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as 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 Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.



SECTION 007300 – SUPPLEMENTARY GENERAL CONDITIONS (General Contractor)

North Carolina Department of Administration's State Construction Office Form OC-15, in its entirety, shall constitute the General Conditions of the Contract for Construction (the "General Conditions"). These Supplementary General Conditions of the Contract for Construction ("Supplementary Conditions") are attached to, and made a part of, the Contract Documents and are intended to modify and/or supplement the General Conditions. Capitalized terms used herein but not defined herein shall have the same meanings as in the General Conditions.

ARTICLE 1 – DEFINITIONS

1.1. Subparagraph b.: Revise the first sentence to read as follows:

The owner is the State of North Carolina through North Carolina State University.

1.2. Subparagraph u.: Revise the first sentence to read as follows:

Provide shall mean purchase, deliver, and install, new, clean, and completely operations, fully tested and ready for use.

ARTICLE 14 – CONSTRUCTION SUPERVISION AND SCHEDULE

1.3. Subparagraph e.: Modify the first sentence as follows:

The contractor(s) shall, employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a ~~benchmark~~ benchmark nearby in a location where the same will not be disturbed and where direct instruments sights may be taken.

1.4. Subparagraph f.: Revise the second sentence to read as follows:

The Project Expediter shall be the Contractor.

1.5. Subparagraph g.: Revise the paragraph to read as follows:

It shall be the responsibility of the Contractor to cooperate with its subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a Critical Path Method (CPM) schedule. Each subcontractor shall provide work activities within fourteen (14) days of request by the Contractor. A "work activity", for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill. The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the subcontractor's early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order. The Contractor shall submit the proposed construction schedule to the Designer for comments.

**CPM Schedule:** Where a CPM schedule is required, it shall be in time-scaled precedence format using the Contractors logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in the schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over \$2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

**Early Completion of Project:** The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

#### ARTICLE 23 – TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

1.6. Subparagraph a.: Revise the paragraph to read as follows:

##### **Final Acceptance Achieved by a Calendar Date**

Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Final Acceptance of the entire work by Month, Day, Year. Contractor, upon notice of award of contract, shall prepare a construction schedule to complete the project within this time as required by Article 14.

1.7. Subparagraph b.: Revise the third sentence to read as follows:

##### **Liquidated Damages tied to Final Acceptance**

For each day in excess of the above number of days, the Contractor shall pay the owner, as liquidated damages and not as a penalty, a sum of \$300 dollars per day by which the actual date of Final Acceptance exceeds the Contract Time.

#### ARTICLE 38 – USE OF PREMISES

1.8. Subparagraph d.: Add a second sentence to read as follows:

Contractor shall post a sign indicating Firearms are prohibited on the construction site.

## SECTION 011000 – SUMMARY

## PART 1 – GENERAL

## 1.1. SUMMARY

## A. Section Includes:

1. Project Information.
2. Work covered by Contract Documents.
3. Codes and Standards.
4. Specification and drawing conventions.
5. Miscellaneous provisions.

## 1.2. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to the Work of all Sections in the Specifications. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.
- B. Conflicts or discrepancies among the Contract Documents shall be resolved in the following order of priority:
  1. The Form of Contract, as modified by Contract modifications (Change Orders). Change Orders of later date take precedence over those instruments of earlier date;
  2. The General Conditions, as modified by the Supplementary General Conditions;
  3. Specifications;
    - a. Specifications govern Drawings for quality and performance.
  4. Drawings.
    - a. Drawings govern Specifications for quantity and location.
    - b. In the event of a conflict between small-scale detail drawings (e.g. less detailed, 1/8"=1'-0" scale) and large-scale detail drawings (e.g. more detailed, 1-1/2" = 1'-0" scale), the largest scaled drawings take precedence.
- C. In the event of ambiguity or conflicts between Specifications and Drawings, the greater quantity and the better quality shall govern.

## 1.3. PROJECT INFORMATION

- A. Project Identification: CoE Growth - Research Lab Renovation - FWH
  1. Project Location: 915 Partners Way, Raleigh, NC 27606
- B. Project Directory: Refer to Specification Section 000103 "Project Directory".
- C. Project Web Site: A Project Web Site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.
  1. See Section 013100 "Project Management and Coordination" for requirements for establishing, administering, and using the Project Web Site.

#### 1.4. WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of: Selective scope within three work areas totaling 4,072 SF across two floors of an existing building. Scope to include selective demolition, architectural renovation, lab furnishing/equipment, interior finishes, plumbing, mechanical, electrical, fire protection and fire alarm.

#### 1.5. CODES AND STANDARDS

- A. All references to codes, specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the edition referenced in the Appendix B as noted in the Project Drawings.
- B. In addition to the codes, specifications and standards referred to in the Contract Documents all work provided under this Contract shall comply with the applicable provisions of the following, where standards conflict the more stringent shall apply:
  - 1. Electrical Utility: Duke
  - 2. Gas Utility: PSNC Energy

#### 1.6. 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. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

#### 1.7. MISCELLANEOUS PROVISIONS

- A. Special Insurance: Contractor's Commercial General Liability insurance shall contain no exclusion that would deny coverage for any claim arising out of or contributed to by any fungus, mildew, mold, or resulting allergens. If such exclusion exists and cannot be removed by endorsement, Contractor shall submit proof of coverage for fungus, mildew, mold, or resulting allergens under a Pollution Legal Liability or Contractor's Pollution Liability policy.

#### PART 2 - PRODUCTS (Not Used)



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NC State's Requirements

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000





SECTION 011116 – WORK BY OWNER

PART 1 – GENERAL

1.1. SUMMARY

A. Section Includes:

1. Owner Furnished equipment for Contractor Installation (OFCI).
2. Owner Furnished and Owner Installed equipment (OFOI).
3. Owner performed work.

1.2. 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.

1.3. INSURANCE AND SAFETY

- A. Work performed by Owner and/or Owner's Contractors must abide by the Contractor's insurance and safety requirements. Owner and Contractor shall coordinate logistics and schedule to ensure the safe installation of OFOI work.

PART 2 – PRODUCTS

2.1. OWNER FURNISHED EQUIPMENT FOR CONTRACTOR INSTALLATION

- A. New and relocated wall mounted TV's.
1. All blocking to support the OFCI equipment listed herein is by the Contractor.
- B. Relocated Markerboards.
- C. Relocated fire extinguisher cabinets and brackets.
- D. Division 06 – Miscellaneous Carpentry

2.2. OWNER FURNISHED AND OWNER INSTALLED EQUIPMENT

- A. Refer to schedule on sheets LF500 and LF50.

PART 3 - EXECUTION

3.1. OWNER PERFORMED WORK

A. Division 01 – General Requirements

1. All existing valves and circuits must be operated by NC State personnel.

B. Division 02 – Demolition

1. Indicated in Drawings

C. Division 08 – Door Hardware

1. Description of the work performed by Owner indicated in Drawings.



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NC State's Requirements

- D. Division 27 – Telecommunications
  - 1. Description of the work performed by Owner indicated in Drawings.
- E. Division 27 – Audiovisual
  - 1. Description of the work performed by Owner indicated in Drawings.
- F. Division 28 – Security & Access Control
  - 1. Description of the work performed by Owner indicated in Drawings.

END OF SECTION 011000

## SECTION 011400 – WORK RESTRICTIONS

## PART 1 – GENERAL

## 1.1. SUMMARY

## A. This Section Includes:

1. Owner's Representative.
2. Behavior Policy.
3. Working Hours.
4. Use of Premises.
5. Utility Interruptions.
6. Fire Alarm Shutdowns.
7. Hot Work Permits
8. Miscellaneous restrictions.

## B. Related Sections include the following:

1. Section 006000 "Project Forms" for the Outage Request Form and Method of Procedure Form to be submitted by the Contractor when requesting Utility Interruptions.
2. Section 015500 "Vehicular Access & Parking" for additional requirements on access and parking.

## 1.2. 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.

## 1.3. OWNER'S REPRESENTATIVE

- A. NC State has designated a Project Manager to act as the Owner's Representative in all matters pertaining to construction contracts. All official contacts, decisions, directions, problem resolution, coordination and other liaison activities required from NC State will be through the Project Manager. This requirement does not modify the responsibilities of the Designer as stated in the General Conditions of the Contract. The Project Manager for this project is listed in the Project Directory.

## 1.4. BEHAVIOR POLICY

- A. All construction personnel shall be respectful of all members of the NC State community.
- B. Any incidents of disrespect, verbal abuse, threatening statements, unwelcome comments, unwelcome interaction or any form of harassment from any construction personnel toward any member of NC State community is strictly prohibited. Any such act shall constitute sufficient cause for NC State to remove any individual permanently from the project and all NC State property.
- C. Any of the Contractor(s) project personnel who ignore or refuse to take action on any requirements of the contract documents or ignore or refuse to take immediate action to correct any endangerment to the health and safety of the public (as solely determined by NC State) shall be permanently removed from the project and NC State property.

- D. If in the sole determination of NC State, it is in the best interest of the project and NC State to have any of the Contractor(s) personnel removed from the project, then the Contractor shall do so upon request by NC State. Such actions taken by NC State shall not constitute grounds for a delay claim. NC State will not be responsible for any delays caused to the project due to any individual being removed from the project by NC State.

1.5. WORKING HOURS

- A. The Contractor may establish a work schedule of his own choosing. There are no restrictions regarding work hours, except as noted herein. The Contractor shall submit to NC State and to the Designer his regular daily work schedule and shall notify NC State in writing one week in advance of any deviations from the schedule.
- B. NC State reserves the right to limit the Contractor's activities when they conflict with NC State operations at no additional cost or delay to the project. During times in which construction operations conflict with NC State operation, NC State may require the Contractor to cease all construction activities, limit activities to on-site only, modify working hours, make accommodations for access, restrict noise-making activities, or other limitations as determined by NC State. Instances in which construction operations may conflict with NC State operations include, but are not limited to, the following:

- 1. Study and Examination periods;
- 2. Graduation;
- 3. Athletic or Special events;
- 4. Student move in/move out days.
- 5. 2024 Holidays and Closings:
  - a. Thanksgiving Thursday, Nov. 28
  - b. Day after Thanksgiving Friday, Nov. 29
  - c. Winter Break Tuesday, Dec. 24
  - d. Winter Break Wednesday, Dec. 25
  - e. Winter Break Thursday, Dec. 26
  - f. Winter Break Friday, Dec. 27
  - g. Winter Break Monday, Dec. 30
  - h. Winter Break Tuesday, Dec. 31
- 6. 2025 Holidays and Closings:
  - a. New Year's Day Wednesday, Jan. 1
  - b. MLK Jr. Day Monday, Jan. 20
  - c. Memorial Day Monday, May 26
  - d. Independence Day Friday, July 4
  - e. Labor Day Monday, Sept. 1
  - f. Thanksgiving Thursday, Nov. 27
  - g. Day after Thanksgiving Friday, Nov. 28
  - h. Winter Break Wednesday, Dec. 24
  - i. Winter Break Thursday, Dec. 25
  - j. Winter Break Friday, Dec 26
  - k. Winter Break Monday, Dec. 29
  - l. Winter Break Tuesday, Dec. 30
  - m. Winter Break Wednesday, Dec. 31

1.6. USE OF PREMISES

**A. Parking & Staging Areas**

1. Parking is extremely limited at NC State. Parking for personal vehicles on campus is not provided by NC State and is the responsibility of the Contractor. Contractors must limit parking of company vehicles and storage of materials to within the limits of the construction site and staging area.
2. The Contractor is required to follow NC State Transportation's Contractor Parking Policies as described online at: <https://transportation.ncsu.edu/construction-parking-information/>
3. Reserved Spaces & Staging Areas must be approved in advance by NC State's Project Manager and NC State Transportation. A current logistics plan must be submitted by the Contractor to NC State in order for any reserved spaces or staging areas to be approved.

**B. Traffic Movement & Interruptions**

1. The Contractor shall make requests for approval for any street, alley, driveway or any access way to be closed at least fifteen (15) workdays prior to the date for the desired closing.
  - a. The request shall be accompanied by a proposed traffic control plan prepared by the Contractor detailing all signage and detour routes in accordance with MUTCD current revision requirements.
  - b. The plan must be reviewed and approved by Designer and NC State.
2. The Contractor shall close no street, alley, driveway or access-way without prior approval by NC State. Contractor shall only install a blockage after NC State has provided written approval of the proposed blockage.
  - a. All blockages and detours shall be planned, subject to approval by NC State, considering handicapped access.
3. The Contractor shall install warning signs, barricades, and detour information signs to maintain traffic flow as directed by NC State, and in accordance with MUTCD requirements. If required, flagmen provided by the Contractor shall direct traffic around the construction area or detour area.
  - a. At all times, pedestrian and vehicle traffic wayfinding around the construction limits must be maintained in a clean and safe condition.
4. NC State is a handicap accessible campus. All barricades, temporary walkways, excavations, and stockpiled materials shall be placed and/or constructed in such a manner as to accommodate, adequately warn, and protect all members of the campus community, as well as the general public. Contractor shall not block accessible pathways without providing suitable alternative accessible pathways as agreed upon by Designer and NC State. Owner reserves the right to reject or modify Contractor's Site Logistics Plan as necessary to ensure handicap accessibility throughout campus.
5. No excavations shall take place prior to placing proper barricades, lighting, and other devices as shall be required.

**1.7. UTILITY INTERRUPTIONS**

- A. The Contractor shall ensure all campus utilities and other campus services are maintained throughout the Project, except for scheduled interruptions.
- B. The Project anticipates, at a minimum, the following outages to occur:
  - 1. There are no expected power outages within the context of this project. If there is one deemed needed, the contractor to follow the protocols established in sections 1.8 C, D.
- C. The Contractor shall submit an Outage Request to NC State's Project Manager at least fourteen (14) calendar days in advance for minor outages and thirty (30) calendar days in advance for major outages. While the Outage Request Form provided in Section 006000 "Project Forms" lists shorter durations, the durations listed herein are required so all communication, collaboration, and coordination can occur to ensure a successful Outage.
  - 1. No utility interruption, regardless of the advance notice given, shall be undertaken without written approval from NC State.
  - 2. All Outage Requests for a utility interruption must include an Outage Request Form and a Method of Procedure (MOP) describing the sequence of operations for the work to be performed by the Contractor during the outage. Incomplete Outage Requests will not be processed.
  - 3. Upon receipt of the Outage Request Form and MOP, NC State will notify the Contractor that the Contractor can schedule a coordination meeting with NC State's Project Manager and appropriate personnel from the NC State Zone Shop or Department, and other interested parties, to discuss the Outage Request and the MOP.
    - a. No outage will be scheduled without a coordination meeting.
  - 4. NC State may determine the utility service cannot be interrupted for the length of time or frequency requested by the Contractor.
  - 5. NC State will determine if an outage is considered major or minor.
  - 6. Examples of major outages include, but are not limited to, outages impacting:
    - a. An entire building;
    - b. An entire floor of a building;
    - c. All or parts of several buildings;
    - d. All or parts of an area;
    - e. Any high voltage outage.
- D. If requested by NC State, utility outages shall be performed after hours and/or at night, or over the weekend, or during holidays. No extra payment will be made for such work. Anticipated off hour outages on the project are as follows:
  - 1. There are no expected power outages within the context of this project. If there is one deemed needed, the contractor to follow the protocols established in sections 1.8 C, D.

- E. Certain activities of utility outages must be performed by NC State and cannot be performed by the Contractor. Examples of activities to be performed by NC State include, but are not limited to:
    - 1. Operating existing electrical switches;
    - 2. Turning existing water, chilled water, and steam valves;
    - 3. Placing existing building systems back in operation;
    - 4. Operating existing fire alarm systems.
  
  - F. While NC State will provide reasonable support to the Project at no cost to the Contractor, when the Contractor requires an additional or extra outage to complete their work because of a shortage of or improper materials, shortage of labor, poor coordination, failure to finish the work during the outage scheduled length of time, the Contractor will pay all expenses incurred for NC State's services for an additional outage(s) via deductive Change Order.
  
  - G. Signs and barricades (if applicable) for utility outage notice shall be written and placed as directed by NC State seven (7) workdays prior to the outage. No outage shall take place until signs and barricades (if applicable) are in place to notify and/or protect the public. Signs and barricades (if applicable) must be maintained throughout the outage.
    - 1. Signs shall be neat and legible, hand-made signs are not acceptable.
  
  - H. The Contractor shall include in his base bid provisions for temporary utility equipment and services for the duration of the outage(s) required to complete the Project. Anticipated shutdowns on the project are as follows:
    - 1. Powering systems by generator
    - 2. Temporary HVAC
- 1.8. FIRE ALARM SHUTDOWNS
- A. The Contractor shall schedule all fire alarm shutdowns to support the Project with NC State's Project Manager at least five (5) workdays in advance. Fire Alarm shutdowns must be conducted by NC State.
  
  - B. If at any time the fire alarm system is not in operation after normal working hours then the Contractor shall be required to employ a Fire Watch for the unprotected portion of the building, using a Fire Watch company approved by NC State's Fire Marshal.
- 1.9. HOT WORK PERMITS
- A. When the Contractor is performing work that produces heat, flame, or sparks on or in an existing building or other structure the Contractor is required to obtain a "hot work" permit from NC State Environmental Health and Public Safety, Fire Protection Department. The department's requirements for the hot work program and permit can be found at the web link on the first page of this document. The EH&PS Hot Work Policy (rev. May 1, 2022) is appended to the end of this section.
  
  - B. <https://fls.epsi.ncsu.edu/forms/hot-work-permit-request/>
- 1.10. MISCELLANEOUS RESTRICTIONS
- A. Controlled Substances: Use of tobacco products and other controlled substances on NC State's campus is not permitted.



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1. Exception: Controlled substances as prescribed by a doctor are allowable provided appropriate documentation that does not violate HIPPA requirements is available.
- B. Firearms are prohibited on all university property.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011400



## SECTION 012200 – ALTERNATES

## PART 1 – GENERAL

## 1.1. SUMMARY

- A. Section includes administrative and procedural requirements for alternates.
- B. Related Sections include the following:
  - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

## 1.2. 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.

## 1.3. DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

## 1.4. PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

## PART 2 - PRODUCTS (Not Used)

## PART 3 – EXECUTION

## 1.3. SCHEDULE OF PREFERRED BRAND ALTERNATES

- A. PB-1 Electrified Door Hardware (Specification Section 08 7100)

1. Base Bid: As indicated in Specifications.
  2. Preferred Brand Alternate Bid: NCSU Campus Standard Electrified Door Hardware Components.
    - a. Access Control System and Equipment Software by House 9000.
    - b. Access Control Video Platform by Genetec.
    - c. Access Control CCTV Cameras by Axis Communications.
    - d. Electrified Mortise Locksets by one of the following: Schlage L9092EU with LX/RX/DPS **OR** Best 45HW7DEU with LX/RX
    - e. Electrified Access Control Exit Devices by Von Duprin 98/99/33 Series QEL with LX/RX switch
    - f. Wireless Access Control Locksets by one of the following: Schlage LE Greenwich with DPS **OR** Schlage AD-400 with DPS.
    - g. Door Hardware Power Supplies by one of the following: Altronix AL600ULACMCB with Access module (field application) **OR** Altronix Maximal 33 (Security Headend Application only) **OR** Life Safety Power NetLink Integration with C-CURE 9000 (headend applications only)
    - h. Electric Power Transfer Hinge by Von Duprin, EPT-10
    - i. Card Access Turnstiles by Boon Edam Slimline Series
- B. PB-2 Mechanical Door Hardware (Specification Section 08 7100)
1. Base Bid: As indicated in Specifications.
  2. Preferred Brand Alternate Bid: NCSU Campus Standard Mechanical Door Hardware Components.
    - a. Mortise Locks, Keys and Cylindrical Deadbolts by one of the following: Best, 45H DTA0 **OR** Schlage 9050/9070/9080
    - b. Manual Door Closers by LCN
    - c. Panic Hardware and Strikes by Von Duprin 98/99 (rim, vertical rod and mortise)
    - d. Fire Rated Exit Devices by one of the following: Von Duprin (rim, vertical rod and mortise)
    - e. Key Blanks 7 pin by one of the following: Schlage **OR** Best
    - f. Cores, small format interchangeable, 7 pin, by one of the following: Schlage **OR** Best
    - g. Power Operators by LCN 4630/4640/6440 Compact
    - h. Power Operators by LCN Senior Swing 9542/9531/9553
    - i. ADA Operator Power Supply by Von Duprin PS 902/904 4RL
- C. PB-3 Building HVAC Controls (Specification Section)
1. Base Bid: As indicated in Specifications.
  2. Preferred Brand Alternate Bid: HVAC Controls
    - a. Building Automation System by Johnson Controls, Inc.
    - b. Building Automation System by Schneider Electric
- D. PB-6 Energy Management Meters (Specification Section)
1. Base Bid: As indicated in Specifications.
  2. Preferred Brand Alternate Bid: Energy Management Meters

- a. Condensate by Cadillac CMAG magnetic flowmeter
- b. Steam by Accelabar
- c. Chilled Water by Flexim Flexus F721E Energy Ultrasonic Flowmeter
- d. City Water by Neptune Truflor
- e. Electricity by Nexus 1262

#### 1.4. SCHEDULE OF ALTERNATES

##### A. Alternate #1: Baffles

1. Base Bid: Do not provide alternate baffles and suspension system.
2. Alternate Bid: Provide acoustical suspended ceiling baffles and suspension system. Mount at all one level 11' at finish flooring. The existing lighting to be rehung at 10' on new suspension cables. Current arrangement and lighting quantity to remain. Baffles to be spaced 1'-0" O.C. per arrangement shown on drawings. Provide (81) 8'-0" units with system centered in room.

##### B. Alternate #2: Room 1363 Entry Door Sidelite

1. Base Bid: Do not provide a sidelite on door 1363. New door to be provided per drawings.
2. Alternate Bid: Provide aluminum framed sidelite to door 1363 per the drawings. Refer to elevation 1/A500 for details.

END OF SECTION 012300

## SECTION 012500 - SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
  - 1. Section 006000 "Project Forms" for the Substitution Request Form.
  - 2. Section 007200 "General Requirements" for requirements on when Substitutions are allowable.
  - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
  - 4. Section 013300 "Submittal Procedures" for administrative requirements for submittals.
  - 5. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

## 1.2 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. 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. Substitutions after bidding are only allowed if it can clearly be demonstrated that the substitution is for the sole benefit of the Owner, and the Designer and Owner approve of the substitution.

## 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, as limited to the following conditions:
    - a. Unavailability of product within the Contract Duration;
    - b. Regulatory or significant manufacturing changes that prevent the manufacture or delivery the product;
    - c. Net savings to the project, either in Contract Duration or Project Cost. If there is a time savings, the Contractor must also return to Owner the corresponding savings to General Conditions. Contractor is responsible for Designers time to detail the substitution, which may negate Contractors proposed savings and be a net addition to the project cost, in which case the substitution would not be allowable.
  - 2. Substitutions for Convenience: All other changes proposed by Contractor. Substitutions for convenience are not allowed.

## 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Identify product or fabrication or installation method to be

replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution requests must be submitted by the Contractor in a timely manner so the request can be reasonably evaluated so as not to impact the Project Schedule. Delays resulting from the Substitution Request process shall not relieve the Contractor from its obligation to complete the project within the duration specified in the Contract Documents.
2. Substitution Request Form: Use "Substitution Request" form provided in Section 006000 "Forms."
3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
  - a. Provide Contractor Name, address, and contact information for individual responsible for the substitution request.
  - b. Provide Project Name, NC State Project Number, and SCO Project Number.
  - c. Provide product specified, the specification section where specified, and the drawings where the product is indicated.
  - d. Provide a statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
  - e. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, necessary to accommodate proposed substitution.
  - f. Detailed comparison of significant qualities of proposed substitution 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.
  - g. Product Data, including drawings and descriptions of proposed products and fabrication and installation procedures.
  - h. Samples, where applicable or required.
  - i. Certificates and qualification data, where applicable or requested.
  - j. List of similar installations for completed projects with project names and addresses and names, email, and phone number, of architects and owners.
  - k. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - l. Research reports evidencing compliance with building code in effect for Project.
  - m. Detailed comparison of Contractor's construction schedule using proposed substitution 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.
  - n. Cost information, including a proposal of change, if any, in the Contract Sum.
  - o. 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.
  - p. 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.

4. Designers Action: If necessary, Designer will request additional information or documentation for evaluation within seven (7) calendar days of receipt of a request for substitution. Designer will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) calendar days of receipt of request, or seven (7) calendar days of receipt of additional information or documentation, whichever is later. Owner is to approve all substitution requests with Designer prior to Designer notifying Contractor of acceptance.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Bulletin for minor changes in the Work.
  - b. Use product specified if Designer 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 qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

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

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) calendar days prior to time required for preparation and review of related submittals as defined by the submittal schedule.
  1. Conditions: Designer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Designer 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. If the Project has identified a sustainable certification goal, the requested substitution provides sustainable design characteristics that specified product provided for achieving sustainable certification prerequisites and credits.
    - c. The Substitution request is fully documented and properly submitted.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work.
    - h. Requested substitution provides specified warranty.



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- i. 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: Not allowed unless otherwise indicated by NC State.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

## SECTION 012600 – CONTRACT MODIFICATION PROCEDURES – Hard Bid Contracts

## PART 1 – GENERAL

## 1.1. SUMMARY

## A. This section includes:

1. Minor Changes in the Work
2. Owner Initiated Proposal Requests
3. Unit Price Change Orders (General Conditions Article 19 "Method c(1)")
4. Equitable Value Change Orders (General Conditions Article 19 "Method c(2)")
5. Change Order Procedures
6. Field Orders
7. Weather Delays

## B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 012900 "Payment Procedures" for administrative procedures for submitting and processing payment applications.

## 1.2. 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.

## 1.3. DEFINITIONS

- A. Overhead: Contractors cost to perform the General Conditions of the Contract and all general requirements detailed in Division 01 of the Specifications, including, but not limited to: project management, scheduling, home office expense, engineering and layout, reproduction expenses, shop drawing processing and coordination, supervision, coordination, small tools, all vehicle expenses, temporary facilities, safety provisions, as built drawings, estimating, and general overhead.

- B. Labor Burden: actual costs of labor burden, limited to including the following. Labor Burden shall not exceed thirty percent (30%) of the actual costs of labor.

1. Actual costs of Social Security (FICA) and Medicare/Medicaid taxes;
2. Unemployment insurance;
3. Health, dental, and vision insurance premiums;
4. Paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of thirty (30) days per year;
5. Retirement contributions;
6. Worker's compensation insurance premiums;
7. Costs of general liability insurance when premiums are computed on payroll amounts

## C. Weather Day (potential definitions):

1. Precipitation that prevents work on the critical path from being performed for more than four (4) hours in a given day;



2. Project Site conditions, as a result of precipitation (regardless of whether such precipitation occurred on that day or a prior day), such as mud, pooling of water, ice, standing snow, or wet building component surfaces to the extent such site conditions prevent the performance of Work activities on the critical path;
3. Wind speeds, as measured by a project site gauge, exceeding those permissible to use equipment or to perform certain tasks safely (such as not being able to safely use or operate cranes or other aerial equipment) that prevent the performance of Work on the critical path;
4. Installation of temporary protection measures and/or dismantling of equipment necessary to prepare the Project Site for extreme weather events, such as named storms and flooding; removal of temporary protections, clean-up, and restoration of Project Site that prevent the performance of critical path activities.

#### 1.4. ACTION SUBMITTALS

- A. Five Year Climatic Average: No later than fifteen (15) workdays prior to mobilization, submit a five (5) year climatic range average based on statistics kept by the National Weather Service at Raleigh-Durham International Airport.

#### 1.5. MINOR CHANGES IN THE WORK

- A. Designer may issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on "Bulletin" form included in Section 006000 "Project Forms."

#### 1.6. OWNER INITIATED PROPOSAL REQUESTS:

- A. Designer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time on "Proposal Request" form included in Section 006000 "Project Forms". If necessary, the description will include supplemental or revised Drawings and Specifications.
  1. Bulletins with "Designers Request for Contractor's Proposal" indicated, issued by Designer are not instructions either to stop work in progress or to execute the proposed change.
- B. Within seven (7) calendar days after receipt of Bulletin, or within a duration mutually agreed upon in writing by Owner, Designer, and Contractor, the Contractor shall submit a written proposal to Owner estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
- C. Owner Initiated Proposal Request Format:
  1. Use "Change Order Request" Form included in Section 006000 "Project Forms" or similar form approved by Designer and Owner as a cover page for the Change Order Request.
  2. Backup to support the Change Order Request conforming to the requirements of Unit Price Change Orders or Equitable Value Change Orders as described herein.
  3. Complete "HUB Change Order Form" included in Section 006000 "Project Forms".
  4. Contractor's Schedule Update Report conforming to the requirements of Section 013216 "Construction Progress Schedule". In the narrative portion of the Schedule Update Report, describe the effect of the changes requested, 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.

5. Completed "HUB Utilization Form" as included in Section 002126 "Guidelines for Recruitment and Selection of Minority Businesses for Participation in the University of North Carolina Construction Contracts".
6. Surety Certification: In the Change Order Request, Contractor shall include a signed statement that states: "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." Contractor shall only notify Surety of change in contract value after a Change Order has been issued, but shall include the statement in each Change Order Request.

1.7. CONTRACTOR INITIATED PROPOSALS:

- A. If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a Change Order Request to Designer and Owner. Claims must be submitted by the Contractor to NC State and Designer within seven (7) calendar days in accordance with Article 20 of the General Conditions.
  1. Use "Change Order Request" Form included in Section 006000 "Project Forms" or similar form approved by Designer and Owner as a cover page for the Change Order Request.
  2. A written description 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.
  3. Backup to support the Change Order Request conforming to the requirements of Unit Price Change Orders or Equitable Value Change Orders as described herein.
  4. Complete "HUB Change Order Form" included in Section 006000 "Project Forms".
  5. Contractor's Schedule Update Report conforming to the requirements of Section 013216 "Construction Progress Schedule". In the narrative portion of the Schedule Update Report, describe the effect of the changes requested, 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. Completed "HUB Utilization Form" as included in Section 002126 "Guidelines for Recruitment and Selection of Minority Businesses for Participation in the University of North Carolina Construction Contracts".
  7. Surety Certification: In the Change Order Request, Contractor shall include a signed statement that states: "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." Contractor shall only notify Surety of change in contract value after a Change Order has been issued, but shall include the statement in each Change Order Request.

1.8. UNIT PRICE CHANGE ORDERS - Article 19, Method c(1)

- A. Description and estimated quantities of unit prices for the project are specified in Section 012200 "Unit Prices". The value of each unit price is indicated on the Form of Proposal incorporated into the Contract Documents.
- B. Value of the change shall be computed by the application of unit prices based on mutually agreed upon quantities.
  1. If the mutually agreed upon quantities exceed the estimated quantity allowance described in Section 012200 "Unit Prices", then either party may elect to proceed with an Equitable Value Change Order in lieu of a Unit Price Change Order. If neither

party elects to proceed with an Equitable Value Change Order, then the unit prices shall apply.

2. No Additional allowances for Overhead and Profit shall be included in Unit Price Change Orders, as the value of the Unit Prices already includes Contractors Overhead and Profit.

#### 1.9. EQUITABLE VALUE CHANGE ORDERS

- A. When the method of determining the value of a change order is considered to be an equitable value for the work instead of being controlled by predetermined unit prices, the Contractor, Designer, and Owner shall negotiate and agree upon the equitable value of the change prior to issuance of the Change Order.
- B. The change order cost breakdown shall differentiate between work performed by the General Contractor and work performed by Subcontractors.
- C. The Change Order shall be organized in a manner consistent with the Schedule of Values of the contract, as detailed in Paragraph 1.5.B of Section "012900" Payment Procedures".
- D. The change order cost breakdown shall include the following items:
  1. Labor
    - a. Number of hours worked
    - b. Unburdened Labor Rate for each worker
    - c. Actual cost of Labor Burden (not to exceed 30%)
    - d. Overtime or extra pay for holidays or weekends may only be a cost item if approved by Owner.
  2. Material
    - a. Quantity
    - b. Unit cost of materials, including supporting invoices from material suppliers for all materials being submitted for
    - c. Sales tax
  3. Tools & Equipment
    - a. Quantity
    - b. Unit prices for rental for tools (excluding hand tools), equipment, machinery, fuel (if required) and temporary facilities required for the work, including supporting invoices from tool & equipment suppliers for all tools & equipment being submitted for.
  4. Bonds, Insurance, & Permitting
    - a. Actual costs of premiums for bonds, insurance, and permit fees.
  5. Markups for Overhead & Profit (Additive Change Orders)
    - a. All contractors (i.e. all General Contractors/Construction Manager, Subcontractors, and tiered subcontractors) shall be allowed a maximum of ten percent (10%) on work they self-perform.
    - b. The General Contractor / Construction Manager shall be allowed a maximum of five percent (5%) on contracted work of the 1<sup>st</sup> tier Subcontractor.

- c. 1<sup>st</sup> tier Subcontractor shall be allowed a maximum of two and a half percent (2.5%) on contracted work with the 2<sup>nd</sup> tier Subcontractor.
      - d. 2<sup>nd</sup> tier Subcontractor shall be allowed a maximum of two and a half percent (2.5%) on contracted work with the 3<sup>rd</sup> tier Subcontractor.
      - e. 3<sup>rd</sup> tier Subcontractor shall be allowed a maximum of two and a half percent (2.5%) on contracted work with the 4<sup>th</sup> tier Subcontractor.
    - 6. Markups for Overhead & Profit (Deductive Change Orders)
      - a. In the case of deductible change orders, the Contractor shall include no less than five percent (5%) profit in the deduction, but no deduction for overhead.
    - 7. Time
      - a. In the event that the Change Order Request includes a change to the project duration, the Change Order Request shall include the revised project duration and revised dates of Substantial Completion and Final Acceptance.
      - b. Not all time extensions are compensatory. Extended General Conditions for the Contractor will only be allowed in specific circumstances as described in Section 007200 "General Conditions" Article 23.
  - E. Subcontractors pricing and backup shall conform to the "Change Order Request" Form included in Section 006000 "Project Forms" or similar form approved by Designer and Owner, with the inclusion of the Subcontractors letterhead.
  - F. For change orders that delete any part of the work within the change order and/or contain deductive costs, the back up shall show the original material and labor for the deleted work or costs.
  - G. If the change order contains both adds and deducts for the same type of work then the material unit and labor unit costs shown on the back up for the deleted work and the added work shall be the same and the net difference shown.
  - H. Deductive change orders shall show the proper reduction in OH&P and the bond.
  - I. Failure by the Contractor to provide the information requested in this paragraph shall result in rejection of the change order by the designer and a request for re-submittal. Delay in the processing of the change order due to lack of proper submittal by the Contractor in accordance with this paragraph, or due to errors in the change order calculations shall not constitute grounds for a time extension or basis for a claim.
- 1.10. CHANGE ORDER PROCEDURES
- A. Submission of Change Order Request
    - 1. The Contractor shall prepare a Change Order Request conforming to the requirements herein for either an Owner Requested Proposal Request or a Contractor Initiated Proposal and submit the Change Order Request to the Designer for review.
  - B. Review of Change Order Request
    - 1. The designer shall review the Change Order Request to verify correctness and determine if the Contractor's proposed costs are equitable.

2. If the Designer determines the Change Order Request is correct and agrees to its accuracy, the Designer will forward the Change Order Request to NC State for their review.
  3. If NC State determines that the cost is equitable then NC State shall notify the Designer of their acceptance.
  4. If either the Designer or NC State determines the Change Order Request is incorrect, or the cost has not been agreed upon by the designer and NC State then the Designer shall notify the Contractor that the proposal is rejected and the proposal shall be resubmitted.
- C. Interscope / Issuance of Change Order
1. Once Change Order Requests have been reviewed and approved by the Contractor, Designer and NC State, the Designer shall initiate a Change Order in the State Construction Office (SCO) web-based Interscope program to incorporate the, or multiple, Change Order Request(s) into the Contract Documents. All Change Orders shall be processed for signatures electronically through Interscope. Directions for using Interscope shall be provided at the Preconstruction Conference.
- 1.11. FIELD ORDER
- A. Designer may issue a Field Order on "Field Order" Form included in Section 006000 "Project Forms".
  - B. Field Order instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Field Order 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.
  - C. Contractor shall maintain detailed records on a time and material basis of work required by the Field Order. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
- 1.12. WEATHER DELAYS
- A. The Contractors Superintendent shall maintain Daily Weather Logs kept at the jobsite showing the effect of the weather on the progress of the critical path work and the critical path schedule, both initialed by the designer's project representative. All contract time extension requests must incorporate these work logs.
  - B. The Contractor may only be entitled to an extension of the contract period for the number of rain days that exceed the normal number of rain days for any given month.
  - C. For the purpose of determining extent of delay attributable to unusual weather, a determination shall be made by comparing the Five Year Climatic Average submittal to the Daily Weather Logs prepared by the Contractor.
  - D. Time extensions for weather delays do not entitle the Contractor to "extended overhead" recovery and are in all other ways non-compensable.
  - E. Not all rain days above the normal number of rain days will warrant a contract time extension. Justification for the request for rain related contract time extensions must also be based on the effect of the rain on critical path work activity in progress during the period of the request and additionally be predicated on the Contractor's diligent prosecution of the work.



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1. No additional rain days shall be granted for building projects after the building has been "dried-in" as determined by the designer.
  
- F. Requests for contract time extensions based on rain days must be received by the designer on or before the 20th day of the month immediately following the month in which the rain occurred. The request must include all required documentation. All parties to this contract agree that the Contractor has no right to claim a contract time extension if the request is not received by the designer in strict accordance with the procedure set forth in this paragraph.
  
- G. For other types of weather delays, the Contractor is granted one (1) day of contract extension for each day NC State is closed due to weather.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 012600

## SECTION 012613 – REQUEST FOR INTERPRETATION (RFI)

## PART 1 – GENERAL

## 1.1. REQUEST(S) FOR INTERPRETATION (RFI)

- A. General: A Request for Interpretation (RFI) is a Contractor initiated, Owner or Designer formatted, written instrument related to the execution of the Work that is addressed to the Designer. The RFI shall be used by the Contractor as the means for it to ask questions related to the Work; subject to the conditions contained within this article.
1. An RFI which fails to conform to the requirements stated herein, (i.e. is incomplete or contains numerous errors) shall be returned to the Contractor for its completion/rectification without benefit of the Designer's response, in addition, no adjustments for Contract Time or Contract Sum shall be granted for an RFI failing to conform to the requirements stated herein.
  2. Each RFI shall be submitted with such promptness as to cause no delay in the Contractor's own work and in that of any subcontractor. No adjustments of Contract Time or Contract Sum will be granted because of failure to have an RFI submitted with sufficient time to allow for the orderly processing of a response by the Designer.
- B. Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in a prompt manner to avoid delays in Contractor's work or the work of its Subcontractors.
- C. Authorship:
1. Each RFI shall originate solely from the Contractor. An RFI submitted to the Designer by an entity, or individual, other than the Contractor (i.e. a Subcontractor) shall be returned to the Contractor.
- D. Prohibitions: RFIs shall not be used for the following:
1. To solicit consideration by the Designer of a "substitution."
  2. To request an adjustment of the Contract time.
  3. To request an adjustment of the Contract sum.
  4. To solicit comment clarification(s) of any required submittal or shop drawing review that was transmitted by the Designer to the Contractor, unless the comments provided conflict with the Contract Documents.
  5. RFIs shall not be used to transfer coordination responsibility from the Contractor to the Owner or the Designer.
- E. Procedure:
1. The Contractor shall submit all RFIs on the form supplied in Section 006000 "Project Forms" or on a form approve by the Designer and Owner.
  2. Each blank on the RFI form shall be filled in.
  3. Each RFI shall be typewritten and shall be forwarded to the Designer electronically.
  4. Each RFI shall address one subject.
  5. Each RFI shall contain specific reference to the drawing number(s), detail number(s), schedule type(s), bulletin number(s), specification section(s) and paragraph number(s), or other related document(s) which is (are) pertinent to the Contractor's question. The date of each referenced drawing number, bulletin, specification section or other related document shall be identified. In preparing each RFI verify the applicable dimension(s), field conditions, drawing requirements (small through large

scale details), and/or specification section requirements pertaining thereto. Prior to submission of the RFI coordinate the nature of the inquiry with the requirements of other sections or trades as related thereto and responses to previous RFIs. Where supplementary sketches are required to clarify an inquiry the Contractor shall attach supplementary sketches, at large scale, illustrative of the inquiry. Sketches shall include sufficient detail, materials, dimensions, thicknesses, assembly, attachments, relation to adjoining work, structural grid references, and all other pertinent data and information for the Designer to make an informed response.

- a. The Contractor is encouraged to suggest solution(s) to its inquiries, if applicable. Should the Contractor's solution(s) have an impact on Contract Sum or Contract time it shall be so stated within the RFI.
6. Each RFI shall be dated and sequentially numbered.
  7. Each RFI shall be reviewed, and signed, by the RFI Manager prior to transmitting to the Designer.
  8. Duration of RFI Response Upon Receipt: Seven (7) calendar days, pending complete information.
    - a. If Contractor requires a response within seven (7) calendar days due to the RFI impacting work on the critical path of the project, Contractor shall make all reasonable efforts to submit the RFI in a timely manner, note on the RFI that the RFI impacts work on the critical path and identify the deadline for a response, and verbally communicate (i.e. in person, or over the phone) with the Designer that the specific RFI needs to be expedited. This exception should only be utilized as necessary to ensure the timely completion of the project. Contractor shall not frequently rely on this exception to ensure timely completion of the project.
  9. RFIs rejected for incomplete information shall not be logged, or shall be logged separately and clearly identified from outstanding RFIs with complete information.
  10. RFIs that contain content on the prohibitions list shall be excluded from RFI logs, and be resubmitted properly or tracked in a manner applicable to the request.
  11. RFIs received by Designer after 1:00 p.m. will be considered as received the following working day.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by RFI Number. Submit RFI Log to Designer and Owner weekly. Use RFI Log Form included in Section 006000 "Project Forms", or similar form approved by Designer and Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 012613





## SECTION 012900 – PAYMENT PROCEDURES

### PART 1 – GENERAL

#### 1.1. SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Section 006000 "Project Forms" for miscellaneous forms required to be submitted with each Payment Application.
  - 2. Section 002126 "UNC System MB Guidelines & Forms 2024" for HUB forms required to be submitted with Payment Applications.
  - 3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 4. Section 013100 "Project Management & Coordination" for administrative procedures for the requirements of the Subcontractor and Vendor list.
  - 5. Section 013216 "Construction Progress Schedule" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule.
  - 6. Section 013233 "Photographic Documentation" for administrative requirements governing preparation and submittal of Construction Photographs.
  - 7. Section 013523 "NCSU Safety Requirements" for administrative requirements governing the preparation and submittal of the Monthly Safety Report.
  - 8. Section 014400 "Quality Requirements" for administrative requirements governing the Schedule of Tests and Inspections.
  - 9. Section 015000 "Temporary Facilities & Controls" for administrative requirements governing the preparation of the Site Logistics Plan, Erosion-and Sedimentation-Control Plan, Fire-Safety Program, Moisture-Protection Plan, Dust-and HVAC Control Plans, and Vibration Control Plan, as required by project scope of work.
  - 10. Section 017419 "Construction Waste Management & Disposal" for administrative requirements governing the preparation of Construction Waste Management Plan to be submitted by Contractor with Initial Application for Payment.
  - 11. Section 017700 "Closeout Procedures" for the administration requirements for Final Acceptance and the Final Payment Checklist.

#### 1.2. 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.

#### 1.3. 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. PAYMENTWORKS

- A. N.C. State uses PaymentWorks, a third-party onboarding platform that eliminates the risk of business payments fraud and ensures regulatory compliance by automating the complex payee management process.

- B. Prior to any payment being made from N.C. State to the Contractor, Contractor must complete the PaymentWorks supplier registration process.

#### 1.5. SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Items required to be indicated as separate activities in Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Owner and Designer at earliest possible date but no later than fifteen working days before the date scheduled for submittal of initial Applications for Payment.
    - a. Initial format of Schedule of Values must be approved by the Owner and Designer prior to submission of the initial Application for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. NC State Project Name and location.
    - b. NC State Project Number, Code & Item, and State Construction Office Project Number.
    - c. Designer's name and address.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Schedule of Values Organization:
    - a. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents.
    - b. Provide at least one line item for each Specification Section listed in the Table of Contents, except for Divisions 00 and 01.
      - 1) The following sections shall be used for Contractors Division 00 and 01 costs:
        - i. General Conditions.
        - ii. Cleaning.
        - iii. Temporary Facilities.
        - iv. Builders Risk Insurance.
        - v. Bonding.
        - vi. Insurance Programs separate from Builders Risk.
        - vii. Project Closeout.
        - viii. Fee.

- c. When the work of a Specification Section is to be performed by multiple Subcontractors, at least one line item for each Subcontractor shall be provided.
  - d. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
  - e. Break down principal subcontract amounts into separate labor and materials items.
  - f. Breakdown of subcontractor's schedule of values must be true and accurate.
  - g. For line items associated with the minority business subcontractor or supplier as identified in Contractor's Affidavit C "Portion of the Work to be Performed by HUB Certified/Minority Businesses".
- 3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 4. Schedule of Values Updating: Update and resubmit the Schedule of Values no less than seven (7) calendar days before the next Application for Payment when a Change Order(s) results in a change in the Contract Sum for either the Contractor or one of its Subcontractors. Format each change order as described throughout paragraph 1.5.B of this Section. Organize the Schedule of Values so that Change Order(s) are grouped together.

#### 1.6. APPLICATIONS FOR PAYMENT

- A. Each Application for Payment package shall be organized as follows, with each section meeting all the requirements described in subsequent paragraphs herein:
  - 1. Signed cover letter on Contractor's letterhead describing the Payment request including, but not limited to, the NC State Project Number, Code & Item, State Construction Office Project Identification Number, the date of the request, month covered in the application and the number of the application, amount of the request, and a list of included documents.
  - 2. Payment Application Forms.
  - 3. A Consent of Surety Letter that includes the surety's consent to the progress payment and the amount of the payment.
  - 4. Sales Tax Forms, organized by Contractor's summary with Subcontractor backup.
  - 5. Updated Schedule Report, as described in Section 013216, "Construction Progress Schedule".
  - 6. MBE Appendix "E" Form with accurate subcontract amounts and amounts paid.
  - 7. Stored Materials (if applicable), organized by Contractor's summary with Subcontractor backup.
  - 8. Waivers of Mechanic's Lien.
  - 9. Supplemental Information.
- B. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Designer and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- C. Payment Application Transmission & Times: Not later than the fifth day of the month, the Contractor shall electronically submit a signed and notarized copy of each Application for Payment to Designer.
- D. Payment Application Forms: Use AIA Document G702 (Application & Certificate for Payment) and AIA Document G703 (Continuation Sheet) as form for Applications for Payment.

- E. Application Preparation: Complete every entry on the form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Designer 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 of 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 issued before the last day of construction period covered by application.
  4. Indicate separate amounts for work being carried out under Owner-requested project acceleration, if any.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
1. The following requirements apply for Stored Materials:
    - a. Differentiate between items stored on-site and off-site.
    - b. Materials must be customized or fabricated specifically for the project. No raw materials (including, but not limited to piping, conduit, CMU, metal studs and gypsum board, etc.) may be billed as stored materials.
    - c. Contractor is responsible for stored materials and equipment shall remain with the Contractor regardless of ownership title.
    - d. For items stored off-site, the following conditions apply.
      - 1) Material must be stored in an independent, licensed, and bonded warehouse approved by Designer, Owner, State Construction Office, Contractors Insurance Company, and Contractors Surety.
      - 2) Material stored must be clearly identified as NC State property.
      - 3) The warehouse shall be located as close to the project site as possible.
      - 4) Designer must verify that material is stored in compliance with Stored Materials requirements herein.
  2. The Stored Materials backup to be included in the Payment Application is as follows:
    - a. Stored Material Summary. Using the standard form provided in Section 006000, provide summary documentation for stored materials indicating the following:
      - 1) Materials previously stored and included in previous Applications for Payment.
      - 2) Work completed for this Application utilizing previously stored materials.
      - 3) Additional materials stored with this application.
      - 4) Total materials remaining stored, including materials with this application.
    - b. Designer's verification of materials.
    - c. Provide description of item(s) being stored.
    - d. Location of the warehouse(s) where materials or equipment is stored, and warehouse approval letters from each of: Designer, Owner, State

- Construction Office, Contractor's Insurance Company, and Contractor's Surety.
- e. Bill of sale made to Owner stating there will be no additional cost for transportation and delivery of the stored item(s).
  - f. Statement certifying that item, or any part thereof, will not be installed in any construction other than Work under this Contract.
  - g. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials (separate from consent of surety to overall payment application).
  - h. 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.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit notarized waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
- 1. Submit a current Subcontracts and Vendor List.
  - 2. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  - 3. When an application shows completion of an item, submit final or full waivers.
  - 4. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 5. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 6. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Supplemental Information: With each Application for Payment, but as separate files,, submit the following reports, logs, and submittals:
- 1. Submittals Schedule updated the same day of the application. After 50% complete on the contract duration, include closeout submittals in a separate Closeout Submittal Schedule.
  - 2. Construction Photographs taken within 2 days of the application for payment documenting progress in the areas under construction.
  - 3. Change Order Log showing issued change orders and potential change orders updated the same day of the application.
  - 4. RFI Log updated the same day of the application.
  - 5. Daily Construction Reports for each work day during the application period.
  - 6. Meeting minutes for meetings conducted by the Contractor during the application period.
  - 7. Monthly Safety Report.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
- 1. List of subcontractors, principal suppliers and fabricators.
  - 2. Products list (preliminary if not final).
  - 3. Schedule of unit prices.
  - 4. List of Contractor's staff assignments and principal consultants.
  - 5. Copies of permits submitted by Contractor (if any).
  - 6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

7. Certificates of insurance and insurance policies.
  8. Performance & payment bonds.
  9. Preconstruction Photographs.
  10. Submittal Schedule
  11. Construction waste management program.
  12. Site logistics & temporary security plans.
  13. Fire-Safety Program.
  14. Moisture Protection Plan.
  15. Dust and HVAC Control Plan.
  16. Site Specific Safety Plan.
  17. Contractors Site Specific Quality Control Plan.
  18. Noise & Vibration Control Plan
  19. Schedule of Tests & Inspections
  20. Scheduling Conference Minutes and Signed Schedules
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Contractor's Affidavit for Release of Liens.
  2. Contractor's Affidavit of Payment of Debts and Claims.
  3. Consent of Surety for Final Payment.
  4. Certificate of Compliance (Completed by Designer)
  5. Certificate of Completion (Completed by Designer)
  6. Completed Tax Statement and Form.
  7. MBE Appendix "E" Form with accurate subcontract amounts and amounts paid.
  8. Survey of New and Existing Sub-Surface Utilities.
  9. Warranties & Guarantees required by the Contract Documents.
  10. Evidence of completion of Project closeout requirements, including, but not limited to:
    - a. Transmittal of required Project Record Documents to Owner.
    - b. Evidence of completion of demonstration and training.
    - c. Transmittal of Attic Stock.
    - d. Reconciliation of Allowances.
  11. Builders Risk Insurance Cancellation Notice.
  12. Certificates of State Agencies required by State Law.
  13. Certification all keys issued to Contractor have been returned to N.C. State Lock Shop.
  14. Certification of no outstanding utility bills.
  15. Final Completion Construction Photographs.
- 1.7. REVIEW OF APPLICATION FOR PAYMENT
- A. Draft Copy: Submit draft (pencil) copy of the Application for Payment ten days prior to due date for review by Designer.
  - B. Draft Copy Review Meeting: The Owner, Designer and Contractor shall meet prior to payment application due date to review the draft (pencil) copy of the Application for Payment. Questions resulting from this review shall be answered by the Contractor and clarified prior to receipt of the official copy of the Application for Payment.
  - C. Upon receipt of the official Application for Payment and other documentation as required by the Designer and Owner, the Designer shall review the documents received to determine if they correspond to the agreements reached during the draft copy review meeting. If necessary,

the Contractor shall revise the Application for Payment to correspond to the agreements reached, execute the Certificate for Payment, and forward the executed copies to the Owner.

- D. The Owner and Designer will rely on the accuracy and completeness of the information furnished by the Contractor. Issuance of a Certificate of Payment, and subsequent payment thereof will not be deemed to represent that the Owner or Designer performed audits of the supporting data, and does not waive Owners right to audit the project.

#### 1.8. INSPECTION & AUDIT

- A. Contractor's "records" shall upon reasonable notice be open to inspection and subject to audit and/or reproduction during normal business working hours. An NC State representative or an outside representative engaged by NC State may perform such audits. NC State or its designee may conduct such audits or inspections throughout the term of this contract and for a period of three years after final payment or longer if required by law.

- B. Contractor's records as referred to in this contract shall include any and all information, materials and data of every kind and character, including without limitation the following:

1. Records
2. Books
3. Documents
4. Subscriptions
5. Recordings
6. Agreements
7. Purchase Orders
8. Leases
9. Contracts
10. Commitments
11. Arrangements
12. Notes
13. Daily diaries
14. Superintendent reports
15. Drawings
16. Receipts
17. Vouchers and memoranda, and
18. Any and all other agreements, sources of information and matters that may in NC State's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Document.

- C. Such records shall include (hard copy, as well as computer readable data if it can be made available):

1. written policies and procedures;
2. time sheets;
3. payroll registers;
4. payroll records;
5. cancelled payroll checks;
6. subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.);
7. original estimates;
8. estimating work sheets;
9. correspondence;
10. change order files (including documentation covering negotiated settlements);
11. back charge logs and supporting documentation;



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12. invoices and related payment documentation;
13. general ledger entries detailing cash and trade discounts earned;
14. insurance rebates and dividends; and
15. any other Contractor records which may have a bearing on matters of interest to NC State in connection with the Contractor's dealings with NC State (all foregoing hereinafter referred to as "records") to the extent necessary to adequately permit evaluation and verification of:
  - a. Contractor compliance with contract requirements,
  - b. Compliance with NC State's business ethics policies, and
  - c. Compliance with provisions for pricing change orders, invoices or claims submitted by the Contractor or any of his payees.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 012900



## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. General project coordination procedures.
  2. Administrative and supervisory personnel.
  3. Construction Management Software.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 012613 "Requests for Information" for requirements associated with RFIs.
  2. Section 013119 "Project Meetings" for requirements associated with project meetings.
  3. Section 013200 "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
  4. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

## 1.2 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.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Subcontractor and Vendor List: Within fifteen (15) calendar days of Notice to Proceed, 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. Use CSI Form 1.5A in Section 006000 "Forms", or similar form approved by Designer and Owner. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
  2. Number and title of related Specification Section(s) covered by subcontract.
  3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. 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, on Project Web site, and by each temporary telephone. Keep list current at all times.

## 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in various 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.
  4. Arrange pipes, ducts, conduits, and other overhead systems in an orderly manner when indicated to remain exposed.
- B. If necessary, 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 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.

## 1.5 CONSTRUCTION MANAGEMENT SOFTWARE

- A. Provide, administer, and use a Construction Management Software (e.g. Plangrid, Procore, or similar) for purposes of hosting and managing project communication and documentation until Final Acceptance. Construction Management Software shall include the following functions:
1. Project directory.
  2. Project correspondence.
  3. Meeting minutes.
  4. Contract modifications forms and logs.
  5. RFI forms and logs.
  6. Task and issue management.
  7. Photo documentation.
  8. Schedule and calendar management.
  9. Submittals forms and logs.
  10. Drawing and specification document hosting, viewing, and updating.
  11. Online document collaboration.
  12. Reminder and tracking functions.
  13. Archiving functions.



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- B. Provide Construction Management Software user licenses for use of the Owner, Owner's Consultants, Owner's Commissioning Authority, Designer, and Designer's consultants.
  - 1. Provide system access privileges for Designer and their consultants to facilitate the following:
    - a. A complete process for online document collaboration during submittal reviews.
    - b. Preparation of reports from the entire database, including archived and closed items.
- C. On completion of Project, provide one complete archive copy of Construction Management Software files to Owner and to Designer in a digital storage format acceptable to Owner.
- D. Contractor, subcontractors, and other parties granted access by Contractor to Construction Management Software shall execute a data licensing agreement in the form of Agreement included in Section 006000 "Project Forms".

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013119 – PROJECT MEETINGS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative provisions for meetings regarding the Project including, but not limited to, the following:
1. General Meeting Requirements
  2. Preconstruction Conference
  3. Prescheduling Conference
  4. Monthly Progress Meeting
  5. Weekly Progress Meeting
  6. Preinstallation Conferences
  7. Pay Application Review Meeting
  8. Project Closeout Conference
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 013100 "Project Management and Coordination" for preparing and submitting the Subcontractor List.
  2. Section 013200 "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule and schedule reports
  3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  4. Section 017700 "Closeout Procedures" for coordinating Contract closeout.

## 1.2 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.

## 1.3 GENERAL MEETING REQUIREMENTS

- A. Schedule and physically conduct meetings at Project site or within a safe meeting space in close proximity to the Project, unless otherwise indicated.
1. Use of virtual meetings is allowable, but at least one representative from each entity invited to the meeting should be in person to facilitate discussion and item resolution.
- B. Requirements herein apply to all meetings, regardless of the meeting organizer.
1. Attendees: Meeting organizer shall inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
    - a. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Meeting organizer shall prepare the meeting agenda and distribute the agenda to all invited attendees no less than three (3) calendar days prior to the meeting.
  3. Minutes: Meeting organizer shall designate a note taker for the meeting. Record significant discussions and agreements achieved. Meeting organizer shall distribute

the meeting minutes to all meeting invitees within three (3) calendar days of the meeting.

4. Notification: Inform participants three (3) calendar days prior to meetings not regularly scheduled.

#### 1.4 PRECONSTRUCTION CONFERENCE

- A. Designer shall schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, State Construction (if applicable) and Contractor, but no later than fifteen (15) calendar days after execution of the Agreement.

1. Attendees:

- a. Authorized representatives of Owner
- b. Owner's Commissioning Authority
- c. Designer, and their consultants;
- d. Contractor and its superintendent;
- e. major subcontractors;
- f. manufacturers;
- g. suppliers;
- h. testing laboratory representatives;
- i. Other concerned parties shall attend the conference.

2. Agenda: Use the State Construction Office Preconstruction Conference Agenda included in Section 006000 "Project Forms" as a basis for creating the agenda for the Preconstruction Meeting. Do not change the formatting or contents of items 1 through 12 of the State Construction Office Preconstruction Conference Agenda. Beginning with new note 13, discuss items of significance from the list below that could affect progress, including the following:

- a. Review Subcontract List;
- b. Requirements in individual Specification Sections for preconstruction responsibilities;
- c. Attach a full Construction Schedule Report from the Contractor to the meeting notes;
- d. Project coordination;
- e. Site Logistics Plan;
- f. Contractors Quality Control Plan;
- g. Erosion & Sedimentation Control Plan;
- h. Fire Safety Program;
- i. Moisture-Protection Plan;
- j. Dust and HVAC Control Plan;
- k. Phasing;
- l. Hazardous Material Remediation Plan;
- m. Critical work sequencing and long-lead items.
- n. Designation of key personnel and their duties.
- o. Lines of communication.
- p. Procedures for processing Requests for Interpretation (RFIs.)
- q. Procedures for processing Bulletins and Architects Supplemental Instructions (ASI's) and the difference between the two.
- r. Procedures for processing submittals, including electronic photography requirements and sample submittal review procedures.
- s. Procedures for processing substitution requests.
- t. Procedures for testing and inspecting.
- u. Distribution of the Contract Documents.

- v. Preparation of Record Documents.
- w. Use of the premises.
- x. Work restrictions.
- y. Working hours.
- z. Owner's occupancy requirements.
- aa. Responsibility for temporary facilities and controls.
- bb. Procedures for disruptions and shutdowns.
- cc. Construction waste management and recycling.
- dd. Office, work, and storage areas.
- ee. Equipment deliveries and priorities.
- ff. First aid.
- gg. Security.
- hh. Progress cleaning.

#### 1.5 SCHEDULING CONFERENCE

- A. Contractor shall schedule and conduct a Scheduling Conference no less than fifteen (15) working days after Contract Execution.
  
- B. Attendees:
  - 1. Contractor's Preconstruction Manager, Project Manager, and Superintendent
  - 2. Contractor's Scheduler or Scheduling Consultant
  - 3. Subcontractors Project Manager and Superintendent
  - 4. Authorized Representatives of the Owner (Optional)
  - 5. Designer, and their consultants (Optional)
  
- C. Contractor and all its subcontractors shall include a minimum of two (2) full work days in their base bid to attend the Scheduling Conference.
  
- D. Agenda:
  - 1. Develop the Project Schedule that conforms to the contract time.
  - 2. Review methods and procedures related to Contractor's Construction Schedule, including, but not limited to, the following:
    - a. Review software limitations and content and format for reports.
    - b. Verify availability of qualified personnel needed to develop and update schedule.
    - c. Discuss constraints, including phasing work stages and interim milestones.
    - d. Review delivery dates for Owner-furnished products
    - e. Review schedule for work of Owner's separate contracts.
    - f. Review submittal requirements and procedures.
    - g. Review time required for review of submittals and resubmittals.
    - h. Review requirements for tests and inspections by independent testing and inspecting agencies.
    - i. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
    - j. Review and finalize list of construction activities to be included in schedule.
    - k. Review procedures for updating schedule.
  
- E. At the end of the Prescheduling Conference, the Contractor shall deliver to Owner and Designer a Project Schedule, signed by the Contractor's Project Manager and

Superintendent, and each Project Manager and Superintendent for each of Contractor's Subcontractors, as identified on the Subcontract List.

1. No application for payment will be processed until this schedule is accepted by the Designer and Owner.
2. The signed original copy of the Project Schedule resulting from the Prescheduling Conference shall be displayed at the jobsite.

#### 1.6 MONTHLY PROGRESS MEETING

A. Designer shall conduct progress meetings at monthly intervals.

1. Attendees:
  - a. Designer
  - b. Designer Consultants whose discipline is under active construction or will begin within the next month
  - c. Owner
  - d. State Construction Monitor
  - e. Contractor's Project Manager and Superintendent
  - f. The meeting is open to the following optional attendees: subcontractors, material suppliers, and any others who contribute to the progress of the project.
2. Agenda:
  - a. Use Monthly Meeting Agenda included in Section 006000 "Project Forms" as a basis for the Monthly Meeting. Items should remain on the agenda until all actions associated with the note are complete.
  - b. Review and correct or approve minutes of previous progress meeting.
  - c. 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.
  - d. Review Designer's Logs and discuss issues, Information, Instructions, Proposals and Modifications.
  - e. Review any pending change orders or field orders.
  - f. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
3. Reporting:
  - a. Designer shall distribute minutes of the meeting to each party present and to parties who should have been present within three (3) calendar days of the meeting.
  - b. Designer shall upload a copy of the meeting minutes into the State Construction Office InterSCOPE database as Package Documents.

#### 1.7 WEEKLY PROGRESS MEETINGS

- A. Contractor shall conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees:
    - a. Representatives of Owner;
    - b. Owner's Commissioning Authority;
    - c. Designer;
    - d. Contractor's Project Manager and Superintendent;
    - e. Contractor may invite their subcontractors, suppliers, and/or other entities concerned with current progress or involved in planning, coordination, or performance of future activities.
  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:
      - 1) 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.
      - 2) Review schedule for the upcoming two-week period.
      - 3) Discuss long-term schedule needs as necessary.
      - 4) Review Upcoming Work Summary report, as described in Section 013216 "Construction Progress Schedule".
    - b. Review present and future needs of each entity present, including the following:
      - 1) Safety, hazards and risks.
      - 2) Change Order Requests and Change Orders.
      - 3) Request for Information.
      - 4) Submittals.
      - 5) Designer Inspection Reports.
      - 6) Erosion & Sedimentation Update (if applicable).
      - 7) Review condition of tree protection (if applicable).
      - 8) Progress cleaning and site cleanliness.
      - 9) Changes to Site Logistics or Emergency Action Plan.
      - 10) Sequence of operations.
      - 11) Resolution of BIM component conflicts.
      - 12) Status of upcoming samples and/or mockups, and location for review.
      - 13) Deliveries.
      - 14) Off-site fabrication.
      - 15) Access.
      - 16) Site utilization.
      - 17) Temporary facilities and controls.
      - 18) Atypical work hours.
      - 19) Quality and work standards.



- 20) Pending changes
  - 21) Pending claims and disputes.
  - 22) Documentation of information for payment requests.
  - 23) Testing and inspection requirements.
  - 24) Other business relating to the Work.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- 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.

## 1.8 PREINSTALLATION CONFERENCES

- A. Conduct all preinstallation conferences at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Contractor, Subcontractor responsible for the work being discussed at the conference, Designer (architect at a minimum, consultant responsible for the design of the work to also be in attendance), NC State's Project Manager, Commission Agent (if required) and other interested and/or impacted parties within NC State.
  2. Agenda: Contractor shall prepare the meeting agenda and distribute the agenda to all invited attendees at least three (3) workdays prior to the meeting. 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 RFI.
    - 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. Minutes: Contractor shall record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. Contractor shall distribute minutes of the meeting to each party present and to other parties requiring information within three (3) workdays of the meeting.
  4. Notification: Conference shall occur no less than ten (10) workdays prior to activity beginning.
  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.
- B. The following preinstallation conferences are required by NC State. Additional preinstallation conferences may be specified by the Designer within specific Specification Sections within the Contract Documents.
1. Demolition;
  2. Grading, installation of construction fence, underground utility services;
  3. Waterproofing, damp-proofing;
  4. Face brick installation;
  5. Window, Storefront, Curtain wall and other glazing installations;
  6. Landscape;
  7. Roofing installation;
  8. Flooring installation;
  9. Structural Concrete;
  10. Structural Steel;
  11. Casework/Fumehoods;
  12. Fire Alarm-Sprinkler System;
  13. Card reader/Security, Door Hardware;
  14. Audio/Visual;
  15. Replacement and New Installation of Transformers, Switches, etc.

#### 1.9 PAYMENT APPLICATION MEETING

- A. Contractor shall conduct a payment application meeting at monthly intervals.
1. Meeting shall occur between submission of the pencil copy of the payment application to the Designer on the 25<sup>th</sup> day of the month and the last day of the month.
  2. Attendees:
    - a. Owners Project Manager
    - b. Designer;
    - c. Contractor's Project Manager.
  3. Agenda: Review and correct pencil copy of payment application.

#### 1.10 PROJECT CLOSEOUT CONFERENCE

- A. Contractor shall schedule and conduct a project closeout conference, at a time convenient to Owner, State Construction, and Designer, but no later than 80% completion of the Contract Duration, or 90 days prior to the scheduled date of Final Acceptance, whichever is earlier.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees:

- a. Authorized representatives of Owner,
  - b. Owner's Commissioning Authority,
  - c. Designer, and their consultants;
  - d. Contractor and its superintendent;
  - e. Major subcontractors;
  - f. Suppliers;
  - g. Other concerned parties shall attend the meeting.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
- a. Review Completion Schedule.
  - b. Review Final Acceptance Checklist, as included in Section 006000 "Project Forms".
  - c. Preparation of record documents.
  - d. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
  - e. Submittal of written warranties.
  - f. Requirements for preparing operations and maintenance data.
  - g. Requirements for delivery of material samples, attic stock, and spare parts.
  - h. Requirements for demonstration and training.
  - i. Preparation of Contractor's punch list.
  - j. Requirements prior to the preparation of the Designer's punch list.
  - k. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
  - l. Submittal procedures for closeout documents.
  - m. Owner's partial occupancy requirements.
  - n. Installation of Owner's furniture, fixtures, and equipment.
  - o. Responsibility for removing temporary facilities and controls.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013119

## SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Daily construction reports.
  - 2. Material location reports.
  - 3. Unforeseen condition reports.
  - 4. Special reports.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 006000 "Project Forms" for Daily Report and Stored Material Summary forms.

## 1.2 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.

## 1.3 REPORT SUBMISSION FREQUENCY

- A. Daily Construction Reports: Submit weekly.
- B. Material Location Reports: Submit at monthly intervals.
- C. Site Condition Reports: Submit at time of discovery of differing conditions.
- D. Special Reports: Submit at time of unusual event.

## 1.4 INFORMATION SUBMITTALS

- A. Daily Report Template: Submit a copy of Contractors Daily Report Template prior to mobilization.

## 1.5 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. Project Name, SCO Project ID #, NC State Project #
  - 2. Report #.
  - 3. Date & Time report was generated.
  - 4. Weather data: overhead conditions, precipitation (if so, type & how much), temperature (high & low), impact on progress.
  - 5. Document Daily Safety Briefing (refer to Contractor Safety Guidelines 4.0/E).
  - 6. Report Daily Safety Inspections (refer to Contractor Safety Guidelines 4.0/E).
  - 7. Sediment & Erosion Control.
  - 8. Work performed (include all major trades).
  - 9. Total number of Contractor's workers on site.
  - 10. List of subcontractors and the number of their workers at Project site.

11. List of Owner's personnel and the nature of their business at the Project Site.
12. List of other Owner's contractors and the number of their workers at Project site.
13. Equipment at Project site.
14. Material deliveries.
15. Transmittal of salvage or attic stock to Owner, including the list of materials and name of Owner's representative taking possession of materials.
16. Difficulties encountered that may cause delay.
17. Days of no work & reason.
18. Accidents & near misses.
19. Meetings and significant decisions.
20. Unusual events (refer to special reports).
21. Stoppages, delays, shortages, and losses.
22. Report of utility shutdowns performed by Owner at Contractor's request, including, but not limited to: start time, finish time, progress of work, and personnel involved.
23. Meter readings and similar recordings.
24. Tests and inspections, including name(s) of testing and inspection agency(ies).
25. Emergency procedures.
26. Orders and requests of authorities having jurisdiction.
27. Change Orders received and implemented.
28. Field Orders received and implemented.
29. Bulletins, Architect's Supplemental Instructions, or other sketches received.
30. Services connected and disconnected.
31. Equipment or system tests and startups.
32. Substantial Completions achieved (in part or in full) and Final Acceptances authorized.

#### 1.6 UNFORSEEN CONDITION REPORTS:

- A. Immediately on discovery of unforeseen conditions, prepare a detailed report using a Request for Interpretation (RFI). Include a detailed description of the differing conditions, including photos or field reports as necessary to describe and detail the unforeseen condition, together with recommendations for resolving the condition.

#### 1.7 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 – CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Definitions.
  - 2. Reports.
  - 3. Quality Assurance.
  - 4. Coordination.
  - 5. Work Breakdown Structure Overview (WBS).
  
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 012900 "Payment Procedures" for submitting the Schedule of Values.
  - 2. Section 013100 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
  - 3. Section 013300 "Submittal Procedures" for submitting schedules and reports.
  - 4. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.
  - 5. Section 017700 "Closeout" for administrative requirements about Contractor's Statement of Completion with Request for Designers Inspection, Substantial Completion, and Final Acceptance.

#### 1.2 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.

#### 1.3 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 activities are activities on the critical path. They must start and finish on the planned early start and finish times.
  - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
  - 3. Successor Activity: An activity that follows another activity in the network.
  
- B. 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.
  
- C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
  
- D. Event: The starting or ending point of an activity.
  
- E. 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 following activity.
  3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fagnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity Relationships.
- J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.
- K. Work Breakdown Structure (WBS): A deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project, with each descending level of the WBS representing an increasingly detailed definition of the project work.

#### 1.4 REPORTS

- A. Format for Submittals: Submit required submittals in the following format, unless indicated otherwise:
1. Working electronic copy of schedule file in contractor's scheduling software utilized.
  2. PDF electronic file.
- B. Contractor's Initial Construction Schedule: Initial project construction schedule conforming to the requirements herein, submitted within fifteen (15) calendar days of Notice to Proceed. No Applications for Payment will be processed without an approved Initial Construction Schedule. Once approved, this schedule becomes the "Baseline" schedule.
1. Submit a working electronic copy of schedule, exported to Microsoft Project (.mpp) format (regardless of the software used to generate the schedule), and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. Construction Finish Schedule: At 80% project completion (determined by duration not value of work in place), submit a schedule illustrating tasks remaining to complete the project.
- D. Construction Schedule Update Report:
1. Submit, with each Application for Payment, an electronic copy of the Construction Schedule Update Report in .pdf format containing all requirements herein as well as a working electronic copy of the schedule in Microsoft Project (.mpp) format.
  2. Cover Letter: Cover letter shall describe the contents of the report including the following:

- a. Project Name and NC State Project Number,
  - b. SCO Project ID Number,
  - c. Date of Report,
  - d. Contents of the Report,
  - e. Schedule compliance update and status of recovery schedule (if applicable)
  - f. Signed by the Contractor's Project Manager.
3. Signature Page: A signature page (or pages if necessary) must be included in the Update Report, so that in addition to the Contractor's signature representing the accuracy of the updated Schedule, the Project Manager for each Subcontractor (as identified in the Subcontract List submittal) can sign to document their agreement to the updated schedule.
- a. If a Subcontractor does not agree to the updated schedule, they shall write "Exceptions Taken" in the signature line for their company and submit to Contractor a separate written summary of their exceptions and/or inaccuracies on Subcontractors letterhead. Contractor shall include the Subcontractor's written summary, and responses to the exceptions in the Narrative section of the Schedule Update Report.
4. Narrative: Contractor shall include, separate from the Cover Letter, a Narrative that describes what activity changes happened on the project, including the following:
- a. Summary of work completed since the last report,
  - b. Missing data,
  - c. Recent and upcoming changes,
  - d. Documented delays,
  - e. Potential delays, and
  - f. Other facts.
5. CPM Activity Report:
- a. Formatting:
    - 1) Plotted to an 11x17 page with landscape orientation,
    - 2) List of all activities sorted by WBS, activity number, and then early start date, or actual start date if known.
    - 3) Include the Gantt chart in the report, scaled so all information below and the chart fit on one page width.
  - b. Each activity line in the report shall contain the following:
    - 1) Activity number,
    - 2) Activity description,
    - 3) Original duration,
    - 4) Remaining duration,
    - 5) Early start date,
    - 6) Early finish date,
    - 7) Late start date,
    - 8) Late finish date,
    - 9) Predecessor & Successor Activity Numbers, and
    - 10) Total float in working days.
6. Critical Path Report: Using the same format of the CPM Activity Report, generate a report showing only items on the Critical Path of the Project.



7. Total Float Report:
    - a. Format: 8-1/2x11, portrait orientation
    - b. List of all activities sorted by total float, Criticality (Critical: 0 days float, Near Critical: 1 to 10 days of float, and Not Critical: 11+ days of Float), WBS, then activity number.
    - c. Each activity line in the report shall contain the following:
      - 1) Activity number,
      - 2) Activity description,
      - 3) Original duration,
      - 4) Remaining duration,
      - 5) Early start date,
      - 6) Early finish date,
      - 7) Total float in working days.
  8. Change Report, as described in Paragraph 2.2.G. of this Section.
  9. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment in tabular and chart format.
- E. 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 RFI.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.

F.

## 1.5 QUALITY ASSURANCE

- A. Contractors Scheduler, or Scheduling Consultant, Qualifications: Contractor shall employ, or contract with, an experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Designer's or Owner's request.
1. Qualification Data: Submit the resume and/or qualifications for Contractors Scheduler or the Contractors scheduling consultant. Owner reserves the right to approve, reject, or change the Contractors Scheduler as necessary to ensure the project stays on schedule without incurring additional costs.
- B. Conduct Prescheduling conference at Project site to comply with requirements in Section 013119 "Project Meetings."

## 1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.

- 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
  
- C. Coordinate Contractor's construction schedule with Owner's construction schedule for Owner's own forces. Revise Contractor's construction schedule, if necessary, after a joint review and mutual agreement. The construction schedule shall then constitute the schedule to be used by Contractor, separate contractors, and Owner until subsequently revised.

#### 1.7 WORK BREAKDOWN STRUCTURE (WBS) OVERVIEW

- A. All schedules prepared by the contractor shall generally conform to the following Work Breakdown Structure (WBS). Additional details for each WBS are included in subsequent paragraphs in this Section.

- 1. Milestones.
- 2. Inspections & Outages.
- 3. Preconstruction.
- 4. Construction.
- 5. Closeout.

- B. Milestones

- 1. Include, at a minimum, the following milestones in the schedule, within the following structure:

- a. Contract Dates (if project includes multiple phases, include the following for each phase)

- 1) Contract Execution
- 2) Notice to Proceed
- 3) 15 Days after NTP (due date for various submittals)
- 4) 30 Days after NTP (due date for various submittals)
- 5) 80% Duration Complete
- 6) Contractor's Statement of Completion with Request for Designer's Inspection
- 7) Substantial Completion
- 8) Final Acceptance

- b. Coordination Effort

- 1) MEPFP Coordination Drawings Ready for Review (can be multiple milestones if required by the project)
- 2) Casework & Fume Hood Submittals & Shop Drawings Ready for Review, if necessary (due within 30 calendar days from Notice to Proceed)

- c. SCO Monthly Meeting Dates

- d. Progress Milestones

- 1) Chilled Water Complete.
- 2) Footings Complete.
- 3) Structure Complete.
- 4) Roof Complete.
- 5) Envelope Complete / Dry-in.
- 6) Sitework Complete.

## C. Tests, Inspections &amp; Outages

1. Contractor Tests & Inspections:
  - a. Stair & Ramp Survey (if required)
  - b. Moisture Testing for Flooring
  - c. Contractors Pre-Final Punch List
  - d. Testing, Adjusting, and Balancing
  - e. Pre-Functional Testing
2. Designer Tests & Inspections:
  - a. Backflow Preventer Test (if not by Contractor)
  - b. Designer Punch List
  - c. Designer Pre-Electrical Inspection
3. Designer and NC State Tests & Inspections:
  - a. In-wall Inspections
  - b. Above Ceiling Inspections
  - c. Generator Load Test
  - d. Fire Pump Test
  - e. Fire Sprinkler Main Drain Tests
  - f. Pre-Final Inspections
  - g. 100% Test of the fire detection and alarm system
  - h. Third Party materials testing / special inspections / commissioning
  - i. Piping Pressure Testing
  - j. Telecom/Data Wiring Tests & As-Builts
  - k. Underground piping, ductbanks, and other components prior to backfill
  - l. Fume Hood Commissioning & Testing
  - m. Final Inspection for Project Acceptance
4. Include, at a minimum, the following tests & inspections, conducted by AHJ
  - a. NFPA, DOI, and DOL Tests
  - b. Beneficial Occupancy
  - c. Final Inspections
5. Include Utility Outages on the schedule, scheduled in accordance with the requirements described in Section 011400 "Work Restrictions".
6. General Requirements
  - a. The Contractor should include a reasonable corrective work period after each inspection so that Contractor has time to work off deficient items identified during each inspection. However, since the duration shown for each corrective work period will be at the Contractor's discretion, and the amount of corrective work needed will be relative to Contractor's quality of work, if the corrective work period takes longer than the time identified on the schedule, it does not alleviate Contractor's requirement to achieve the Contract Milestone dates.

## D. Preconstruction

1. Include, at a minimum, the following preconstruction items:

- a. Procurement & Submittals (General) - repeat for each item with a procurement duration longer than six (6) weeks.
  - 1) Prepare Submittal
  - 2) A/E Review Submittal (20 calendar days)
  - 3) Fabricate / Deliver Material
- b. Procurement & Submittals (Sprinkler)
  - 1) Prepare Submittal
  - 2) A/E Review Submittal (20 calendar days)
  - 3) North Carolina State Construction Office Review (approx. 30 calendar days)
  - 4) Fabricate / Deliver Material
- c. BIM Coordination
- d. Safety
  - 1) NCSU Review of Activities (Refer to Paragraph 4.0 of NCSU Safety Manual)
  - 2) NCSU Lift Plan Review (50 calendar days)
- e. Mockups

**E. Construction**

- 1. Work by Contractor – Organized at Contractor's discretion, conforming to reasonably accepted construction standards and coordinated with the Schedule of Values.
- 2. Work by Owner - coordinate with Section 011116, "Work by Owner"
- 3. Acceptance Phase - Include a section that shows an Acceptance Phase showing all activities preparing for Final Acceptance.
  - a. This Acceptance Phase shall include all activities by Contractor, Designer, Owner, and Inspectors required to complete the project. Coordinate activities with Section 017700 "Closeout".

**F. Closeout**

- 1. Include, at a minimum, the following activities in the closeout section:
  - a. Preparation of O&M's (listed by Division)
  - b. Review & Approval of O&M's (listed by Division)
  - c. Preparation of Warranties
  - d. Review & Approval of Warranties
  - e. Training & Demonstration activities
  - f. Attic Stock Transfer

**PART 2 - PRODUCTS**

**2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL**

- A. Time Frame: Extend schedule from date established for the Notice of Award 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.
- B. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define Construction Activities so no activity is longer than fourteen (14) working days, unless specifically allowed by Owner and Designer.
  2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 working days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Include selection process activities for finishes and products specified by allowances or specified to be selected during the sample review process. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  4. Startup and Testing Time: Include not less than 15 days for startup and testing.
  5. Final Acceptance: Indicate completion in advance of date established for Final Acceptance and allow time for Designer's administrative procedures necessary for Final Acceptance.
  6. Punch List and Final Completion: Include not more than 60 days for completion of punch list items and final completion.
  7. Demonstration and Training: Training of Owner's personnel as indicated in Section 017700 "Closeout Procedures."
- C. 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. No constraints, aside from those specifically listed in the Contract Documents, are allowed.
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. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011116 "Work by Owner". Delivery dates indicated stipulate the earliest possible delivery date.
  5. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with other construction projects.
    - b. Examination periods.
    - c. Graduation.
    - d. Athletic Events (if applicable to the project).
    - e. Student Move-in & move-out (if applicable to the project).
    - f. Utility Outages.
    - g. Uninterruptible services.
    - h. Use of premises restrictions.
    - i. Provisions for future construction.
    - j. Seasonal variations or limitations.
    - k. Environmental control.
  6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.

- b. Submittals.
- c. Purchases.
- d. Mockups.
- e. Fabrication.
- f. Sample testing.
- g. Deliveries.
- h. Installation.
- i. Tests and inspections.
- j. Adjusting.
- k. Curing.
- l. Startup and placement into final use and operation.

7. 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 milestones listed in Paragraph 1.7.B. of this Section.

D. Plan of Action and Recovery Schedule:

- 1. A Plan of Action and Recovery Schedule shall be prepared by the Contractor when any of the following occur:
  - a. The Contractor's report indicated delays that would prevent the Contractor's ability to complete the project within the Contract Duration.
  - b. The updated construction schedule is thirty (30) days behind schedule.
  - c. The Contractor desires to make changes to the sequence of work that are, in the opinion of the Owner or Design, major in nature.
- 2. The Plan of Action is due from the Contractor within two (2) calendar days of Owners written demand.
- 3. Recovery schedules are due from the Contractor within five (5) calendar days of Owners written demand.

E. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules. Coordinate with Designer regarding which project management software will be used on the Project. Contractor to provide Owner two (2) licensed copies of the scheduling software for the duration of the Project.

- 1. Allowable scheduling software's include Microsoft Project, Primavera P6, or another software approved by the Owner.
- 2. Smartsheets, Google Sheets, Microsoft Excel, or similar products shall not be used to prepare or update the project schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- 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 30 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, regardless of Designer's approval of the schedule.
  - 2. All activities, except for "Project Start" and "Project Finish", must have at least one predecessor activity and at least one successor activity.
  - 3. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 4. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 5. 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 preliminary 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 commissioning].
    - 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 or 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 list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Principal events of activity.
  4. Immediately 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 revising the 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 monthly progress meeting.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, or as requested by Owner, the Contractor shall update the project schedule to reflect actual construction



- progress and activities. Issue schedule three (3) calendar 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 Actual Completion percentage for each activity.
  4. Notify Owner and Designer a minimum of one week prior to issuance of updated schedule of all anticipated significant revisions to the Construction Schedule.
- B. Distribution: Distribute copies of approved schedule to Designer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post electronic copies of the updated project schedule on the project website.
  2. Post copies in Project meeting rooms and temporary field offices.
  3. 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.
  4. Provide Owner electronic copy of updated schedule in Contractor's scheduling software format.

END OF SECTION 013216

## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

## PART 1 – GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Utility Photographs.
  - 4. Construction Time-Lapse Camera.

## 1.2 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.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Fifteen (15) days after Notice to Proceed, submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. 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 by uploading to web-based project software site and email to Designer & NC State Project Manager. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description in web-based project software site:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Designer.
    - 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 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, and with vibration-reduction technology. 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, Project area and sequential numbering suffix.

#### 1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer & Quality: Construction photographs shall be taken by a member of the Contractors Supervisory team and shall not be blurry. In the event that drone photography is to be used, Contractor shall engage with, or retain, a qualified drone operator. All drone photography must be approved in advance with N.C. State.

- B. 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.

- C. Preconstruction Photographs: Before commencement of excavation or demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner or Designer.

- 1. Flag excavation or demolition areas before taking construction photographs.
  - 2. Take a reasonably sufficient quantity of photographs to reasonably show existing conditions within and adjacent to project before starting the Work.
  - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
  - 4. Failure to submit preconstruction photographs may result in delayed processing of the initial payment application.

- D. Post-Demolition Photographs: After completion of demolition, but before any new construction activities, take photographs of Project site and surrounding areas.

- E. Periodic Construction Photographs: Take a reasonably sufficient quantity of photographs coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Final Completion Construction Photographs: Take a reasonably sufficient quantity of photographs after date of Substantial Completion for submission as Project Record Documents. Owner and Designer will inform photographer of desired vantage points.

#### 1.6 UTILITY PHOTOGRAPHS

- A. In conjunction with survey's required for as-builts, as required by Section 017700 "Closeout Requirements", the following photographs need to be submitted by the Contractor to Owner within two weeks of the backfilling of utilities or completion of the associated construction task. Failure to take appropriate photographs will result in Contractor excavating the work at no addition cost to the Owner so that all photographs can be taken.

- B. The following outline lists the utilities to be located and the data to be collected. Photographs shall be at a minimum resolution of 2200 x 1700. Digital photographs can be submitted in TIFF, JPG, or RAW file formats. File naming shall be all lower case text. File naming shall be as follows: bldg#\_ncsu project number\_util\_photo#.file extention.

For example: 135\_201300001\_util\_1.jpg

1. Steam Tunnel and Lines
  - a. Provide digital photographs of the tunnel, piping and expansions areas.
2. Water Lines - (Domestic, Fire Main, Chilled, Hot Water, & Reuse Waterlines)
  - a. Provide digital photographs of bends and valves.
3. Electric and Communication Duct Banks and Direct Buried Conduit
  - a. Provide digital photographs of the tunnel and conduit configuration.
4. Storm and Sanitary Sewer
  - a. Provide digital photographs of structures.
5. Existing Utilities
  - a. Provide digital photographs of any crossings or conflict between new utilities and existing utilities.
6. Deliverables for Surveys
  - a. The subsurface location data and platting shall be continuous throughout the project.
  - b. All data and plats are due to NC State within two-weeks of the backfilling of utilities or completion of the associated construction task.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

## SECTION 013300 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
1. Submittal Schedule.
  2. Submittal Administrative Requirements
  3. Submittal Procedures regarding Submitting Shop Drawings, Product Data, Samples, and other submittals.
  4. Schedule of Required Division 01 Submittals and associated due dates.
  5. Submittals to be reviewed by Owner in addition to Designer.

## 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Designer'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 Designer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

## 1.3 SUBMITTAL SCHEDULE

- A. No less than fifteen (15) calendar days after Notice to Proceed, Contractors shall submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Designer 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 start-up construction schedule. Refer to Section 012900 "Payment Procedures" for requirements for submission of submittal schedule prior to application for payment. Minimum preliminary submittal shall 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: either Action or Informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Designer's final release or approval.
  - g. Scheduled dates for purchasing.
  - h. Scheduled dates for installation.
  - i. Activity or event number.
- 5. Designer reserves the right to withhold, in addition to retainage, 10 percent of each payment request until the submittal schedule is received and accepted by the Designer.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. 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 Action and Informational submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
    - a. Exception: Where samples for initial selection and samples for verification are both required, submit samples for verification after initial selection has been returned by Designer.
  - 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. Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Designer's receipt of submittal. Designer will document on submittal the date of receipt. Submittals received by Designer after 1:00 p.m. will be considered as received the following working day. 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 twenty (20) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Designer will advise Contractor when a submittal being processed

must be delayed for coordination. Delaying submittals to facilitate coordination between submittals shall not constitute a delay of the Work nor shall it be the basis for an extension of time.

2. Sequential Review: Sequential review is a submittal that requires review by more than one design discipline. Where sequential review of submittals by Designer's consultants, Owner, or other parties is required, submittal schedule shall reflect sequential review. Sequential reviews are anticipated for, but not limited to, the following:

- a. Division 05 Section[s]:

- 1) "Metal Fabrications."

- b. Division 07 Section[s]:

- 1) "Joint Sealants."

- c. Division 08 Section[s]:

- 1) "Door Hardware."

- d. Facility Services Subgroup Divisions: All Sections.

- e. Site and Infrastructure Subgroup Divisions: All Sections.

- f. Process Equipment Subgroup Divisions: All Sections.

3. If intermediate submittal is necessary, process it in same manner as initial submittal.

4. Allow twenty (20) calendar days for review of each resubmittal.

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

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.

- a. Unique identifier, including revision number. Submittals shall be numbered with the Section number, followed by a dash, followed by a three-digit number, followed by a dash, and ending with a sequential submission number as indicated below. The numbering system shall be retained throughout all revisions.

- 1) Section Number: Section number where submittal is specified.
- 2) Three-Digit Number: Sequential number, beginning with "001," for each submittal transmitted to Designer for each Section.
- 3) Submission Number: Use "0" for initial submittal, "1" for first resubmittal, "2" for second resubmittal, and so forth.
- 4) Example: 061000-001-0 (Section 061000, first submission of the Section, initial submittal).

2. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Designer.

3. Scanned Copies: Legible scanned PDF files of paper originals are acceptable. Scanned submittals that are not legible will be rejected.
  4. Sheet Orientation: Orient PDF sheets to a "Ready-to-Read" orientation with majority of text horizontal to the sheet with no additional adjustments or formatting required by the viewer.
  5. File Security: Do not set any permissions on the file. Protected documents will not be accepted.
  6. Transmittal Form for Electronic Submittals: Use PDF of completed Submittal Transmittal form in Document 00 60 00 "Project Forms."
  7. Metadata: Include the following information in the electronic submittal file metadata:
    - a. Title: Project title
    - b. Author: Contractor's name.
    - c. Subject: Submittal type (product data, shop drawing, report, etc.)
    - d. Keywords: Number and title of appropriate Specification Section; manufacturer name; product name/model number.
  8. File Transmission: Through project website. Do not transmit submittal via email.
- D. Options: Identify options requiring selection by Designer.
- E. Deviations and Additional Information: Deviations to the requirements of the Contract Documents must follow the Substitution Requirements described in Section 012500 "Substitution Requirements".
- F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are stamped with Designer's action stamp marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."
- G. 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.
- H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals with Designer's action stamp marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS AS NOTED."
- I. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed by Designer and returned to Contractor with Designer's action stamp marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS AS NOTED."
- 1.5 SCHEDULE OF DIVISION 01 SUBMITTALS AND ASSOCIATED DUE DATES
- A. Section 012500 "Substitution Procedure"
1. Substitution Requests: As needed



- B. Section 012600 "Contract Modification Procedure"
  - 1. Five Year Climatic Average: No less than Fifteen (15) Workdays prior to mobilization
- C. Section 012900 "Payment Procedures"
  - 1. Schedule of Values: No less than Fifteen (15) working days prior to submission of initial Application for Payment
- D. Section 013100 "Project Management & Coordination"
  - 1. Vendor & Subcontract List: due within fifteen (15) calendar days of Notice to Proceed.
  - 2. Key Personnel Names: due within fifteen (15) working days of mobilization.
  - 3. BIM Execution Plan and Schedule: due within fifteen (15) calendar days of Notice to Proceed.
- E. Section 013200 "Construction Progress Documentation"
  - 1. Daily Construction Reports: due weekly, template due prior to mobilization
  - 2. Material Location Reports: due monthly
  - 3. Site Condition Reports: due within five (5) calendar days of discovery of differing conditions.
  - 4. Special Reports: due within five (5) calendar days of unusual event.
- F. Section 013216 "Construction Progress Schedule"
  - 1. Contractor's Initial Construction Schedule: due within fifteen (15) calendar days of Notice to Proceed.
  - 2. Construction Finish Schedule: due at 80% project completion
  - 3. Construction Schedule Update Report: due monthly
- G. Section 013233 "Photographic Documentation"
  - 1. Key Plan: due within fifteen (15) calendar days of Notice to Proceed.
  - 2. Digital Photographs: due within three (3) calendar days of taking photographs.
- H. Section 013300 "Submittal Procedures"
  - 1. Submittal Schedule: due within fifteen (15) calendar days of Notice to Proceed.
- I. Section 013523 "NCSU Safety Requirements"
  - 1. Site Specific Safety Plan: due no fewer than fifteen (15) working days prior to mobilization.
  - 2. Crane Plan: due no fewer than fifty (50) working days prior to the crane mobilizing.
  - 3. Safety Reports: due monthly.
- J. Section 014000 "Quality Requirements"
  - 1. Contractor's Site-Specific Quality Program: due not less than five (5) working

- days prior to preconstruction conference.
  - 2. Schedule of Tests & Inspections: submit prior to initial payment application.
- K. Section 015000 "Temporary Facilities & Controls"
- 1. Site Logistics Plan: due not less than five (5) working days prior to preconstruction conference. Updated not less than monthly during construction.
  - 2. Fire-Safety Plan: due not less than five (5) working days prior to preconstruction conference.
  - 3. .
- L. Section 015100 "Temporary Utilities"
- 1. Implementation and Termination Schedule: due prior to mobilization.
- M. Section 015700 "Temporary Controls"
- 1. Erosion & Sedimentation Control Reports: due weekly while Erosion & Sedimentation Control Plan in the Project Documents is active.
  - 2. Moisture & Mold Prevention Plan: due not less than five (5) working days prior to preconstruction conference.
  - 3. Dust & HVAC Control Plan: due not less than five (5) working days prior to preconstruction conference.
  - 4. Noise & Vibration Control Plan: due not less than five (5) working days prior to preconstruction conference
- N. Section 017419 "Construction Waste Management & Disposal"
- 1. Waste Management Plan: Due within thirty (30) calendar days of Notice to Proceed.
- O. Section 017700 "Closeout"
- 1. Closeout Submittal Log: Due at 50% completion, as determined by the project schedule.
  - 2. Contractor's Statement of Completion with Request for Designer's Inspection: Due no later than ten (10) working days prior to Request for Designer's Pre-Final Inspection.
- P. Section 017846 "Maintenance Materials"
- 1. Schedule of Maintenance Material Items: Due within five (5) working days prior to requesting an inspection for Substantial Completion.
  - 2. Maintenance Material Transmittal: Due at Substantial Completion.
- Q. Section 11 5313 "Laboratory Fume Hoods"
- 1. Fume Hood Submittals & Shop Drawings: Due within thirty (30) calendar days of Notice to Proceed.
- 1.6 SUBMITTALS TO BE REVIEWED BY NC STATE IN ADDITION TO DESIGNER
- A. N.C. State reserves the right to review the following submittals:
- 1. Commissioning FTP

2. Lift Plan (if applicable)
3. Safety Plan
4. Training/Warranty
5. Masonry/Precast (Sample Panel)
6. Classroom Lectern
7. Lab Case Work
8. Office Case/Mill Work
9. Roofs
10. Hardware (Keying)
11. Colors (Outdoors)
12. Fume Hoods
13. Indoor Signs (Schedule)
14. Elevators
15. Fire Pumps
16. Fire Sprinkler System (SCO must also approve)
17. Air Compressors
18. Back Flow Preventers
19. Boilers
20. Water Meters
21. Valves
22. Air Handler Units
23. Chiller Water Chemicals
24. Chillers
25. Controls
26. Mechanical Pumps
27. Electrical Panels
28. Power Meters
29. Switch Gear/ Transformers
30. Emergency Generator
31. Audio Visual Systems
32. Fire Alarm System
33. Card Readers
34. Security Infrastructure
35. Telecommunications
36. Irrigation Systems
37. Landscaping

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project. Do not post zipped files.
    - a. Designer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  2. Action Submittals: Submit electronic copies of each submittal, unless otherwise indicated. Designer will electronically return electronic copies. Mark up and retain one returned copy as a Project Record Document.
  3. Informational Submittals: Submit electronic copies of each submittal, unless otherwise indicated. Designer will not return copies.

4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
  5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  6. Systems Submittals: Identify submittals for systems such as fire alarms and fire protection systems, on the transmittal and act upon the system singularly as a combined submittal. If resubmission is required, resubmit entire system submittal,
- 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 catalog cuts.
    - b. Manufacturer's written recommendations.
    - c. Manufacturer's product specifications.
    - d. Standard color charts.
    - e. Mill reports.
    - f. Standard product operating and maintenance manuals.
    - g. Compliance with recognized trade association standards.
    - h. Compliance with recognized testing agency standards.
    - i. Application of testing agency labels and seals.
    - j. Notation of coordination requirements.
    - k. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
- C. Shop Drawings: Prepare and submit Project-specific information, drawn accurately to scale. Do not reproduce, digitally or otherwise, the Contract Documents and submit as Shop Drawings. Do not use, copy or reproduce title blocks, dimensions, notes, keynotes, symbols schedules or details from Contract Drawings, digital or otherwise. Use of the Contract Drawings shall be limited to reproduction, digitally or otherwise, of the exterior wall layout, interior partition layout, grid lines, doors, and windows. Do not base Shop Drawings on standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

- a. Identification of products.
  - b. Fabrication and installation drawings.
  - c. Roughing-in and setting diagrams.
  - d. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  - e. Shopwork manufacturing instructions.
  - f. Templates and patterns.
  - g. Schedules.
  - h. Design calculations.
  - i. Compliance with specified standards.
  - j. Notation of coordination requirements.
  - k. Notation of dimensions established by field measurement.
  - l. Relationship and attachment to adjoining construction clearly indicated.
  - m. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than size of Contract Drawings.
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
  4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
    - a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
    - b. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.
- D. Samples: Submit physical units of materials or products for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Prior to transmission of any samples, coordinate with Designer for determination of submittal review location, where samples are better reviewed on site in contractor's construction field office. Coordinate arrival of samples no less than weekly with Designer to provide advance notice of sample arrival for the following week.
  2. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  3. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
  4. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.

5. Electronic Sample Submittal Requirements: Submit corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record. Submittals without digital photos, not submitted under the contractor's submittal, and without contractor's review stamp shall be returned without review. Criteria for acceptable photography:
  - a. Clear photo of material label. Clearly written labels or manufacturer's labels shall be acceptable.
  - b. Clear photo of label appended by the general contractor indicated for which material the product is being submitted. Utilize labels as found in the drawings on the finish legend wherever available. Utilize adhesive type labels that will not become loose with handling onsite, labeling with a marker or other easily read lettering when photographed.
  - c. Clear photos in well lit conditions without shading on the material to show visual characteristics. Where multiple corners, sides or transitions occur, provide additional photos showing different conditions.
  - d. Materials to be installed on the exterior of the building shall be photographed in natural sunlight to show visual characteristics. Labeling is not required to be photographed in natural light.
  - e. Sample photography for guidance will be provided by the Designer upon request.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. This sample shall be held at the contractor's trailer on site, clearly labeled with the transmittal and stamped submittal, clarifying the use of the material in the project. Samples shall be required to be sorted and stored in a manner to be easily produced upon in person request. Sample sets may be used to determine final acceptance of construction associated with each set.
  - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
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 of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line.
  - b. Designer will return submittal with options selected.
  - c. Refer to Electronic Submittal Requirements for associated photography requirements for all samples.
  - d. Refer to Disposition for on site storage and labeling requirements of all samples.
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:
    - 1) Submit two sets of Samples.
    - 2) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 3) Submit at least three sets of paired units that show approximate limits of variations if variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample.
    - 4) Refer to Electronic Submittal Requirements for associated photography requirements for all samples.
    - 5) Refer to Disposition for on site storage and labeling requirements of all samples.
  - b. Designer will retain one Sample set; remainder will be returned. Mark up and retain one returned physically periodically, as feasible. The primary documentation shall be the contractor's electronic submittal, with the contractor's photograph, which will be returned electronically, unless specifically requested by the Contractor. Contractor to retain one returned sample set as a Project record sample, readily available and clearly labeled for use on site.
9. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Designer's sample where so indicated. Attach label on unexposed side that includes the following:
- a. Generic description of Sample.
  - b. Product name or name of manufacturer.
  - c. Sample source.
10. 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. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
  - c. Refer to Electronic Submittal Requirements for associated photography requirements for all samples.
  - d. Refer to Disposition for on site storage and labeling requirements

of all samples.

- E. Product Schedule or List: Prepare and submit a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- G. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- H. Subcontract List: Prepare and submit 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. Submit on the form included in Document 00 60 00 "Forms," "Subcontractors and Major Material Suppliers List."
1. Submit subcontract list in the following format:
    - a. PDF electronic file.
- I. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation" for action required.
- J. Construction Photographs : Comply with requirements in Section 013216 "Construction Progress Schedule."
- K. Daily Construction Reports: Comply with requirements specified in Section 013233 "Photographic Documentation".
- L. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- M. Certified Surveys: Comply with requirements specified in Section 017300 "Execution."
- N. Closeout Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- O. Operation and Maintenance Data: Submit written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- P. Qualification Data: Submit 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 Designers and owners, and other information specified.

- Q. **Welding Certificates:** Prepare and submit 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.
- R. **Installer Certificates:** Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, where required, is authorized by manufacturer for this specific Project.
- S. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- T. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements.
- U. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements.
- V. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- W. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- X. **Research Reports:** Submit 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.
- Y. **Preconstruction Test Reports:** Prepare and submit 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.
- Z. **Compatibility Test Reports:** Prepare and submit 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.
- AA. **Field Test Reports:** Prepare and submit 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.

- BB. **Manufacturer's Field Reports:** Prepare and submit 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.
- CC. **Manufacturer's Instructions:** Submit 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.
- DD. **Insurance Certificates and Bonds:** Prepare and submit 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.
- EE. **Material Maintenance Submittals:** Comply with requirements specified in individual Sections for quantity and disposition of delivery of extra stock.
- FF. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

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

- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, coordinated, checked, and approved for compliance with the Contract Documents.

### 3.2 DESIGNER'S ACTION

- A. General: Designer will not review submittals that have not been properly transmitted, reviewed by Contractor, or do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Designer will review submittal , make marks to indicate corrections or revisions required, and return it to Contractor. Designer will stamp each submittal with an action stamp as illustrated at the end of this Section, and will mark stamp appropriately to indicate action, as follows:
  1. "NO EXCEPTIONS TAKEN": No further review of Submittal required.
  2. "MAKE CORRECTIONS AS NOTED. Resubmittal not required unless Contractor cannot comply with corrections noted.": Incorporate corrections in Work. If Contractor cannot comply with corrections as noted, revise to respond to exceptions and resubmit.
  3. "REVISE AS NOTED AND RESUBMIT": Revise as noted and resubmit for further review.
  4. "RESUBMIT PROPERLY Submittal not reviewed for reasons noted."
  5. "NOT REVIEWED Submittal not required by Contract Documents.": Remove from submittal log.
  6. "RECEIVED FOR CLIENT'S RECORD ONLY. Submittal not reviewed."
- C. Informational Submittals: Designer will review each submittal and will not return it, or will return it if it does not comply with requirements. Designer 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 Designer.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Submittals not required by the Contract Documents will not be reviewed and may be discarded or returned marked "NOT REVIEWED."
- G. Substitution items received as product data, shop drawing, or sample submittals required by individual Sections will be returned to Contractor without review. Comply with requirements in Section 012500 "Substitution Procedures" for submission of substitution request.

END OF SECTION 013300

## SECTION 013523 – NCSU SAFETY REQUIREMENTS

## 1.0 Purpose

- A. The purpose of this guideline is to define NC State contractor safety requirements. This guideline is intended to be a supplement to the General Conditions of the contract.
- B. The Designer or Construction Manager shall incorporate this document into the Project Manual in its entirety.
- C. Contractors and subcontractors are responsible for the safety of their employees and all persons on and around a work site. Contractors are solely responsible for the development and implementation of their safety programs. This document does not relieve the duty and responsibility of contractors, subcontractors, their agents, employees, and other persons performing portions of the work on a project to comply with federal, state, and/or local laws or regulations that relate to work site safety.

## 2.0 Scope

- A. This document provides contractors with the University's specific requirements that must be incorporated into the contractor's Site-Specific Safety Plan. This document is not designed or intended to replace the contractor's safety program, nor to address every possible safety, environmental, or health hazard associated with the contractor's work. In the event that the contractor's safety program includes a requirement or practice that is more stringent than set forth herein, the more stringent shall be followed. This document does not relieve the contractor of this obligation to: (1) control the means and methods by which its employees and any subcontractors perform work, and (2) independently ascertain what health and safety practices are necessary for the performance of the work.
- B. No specific requirements herein shall be construed to limit, replace, or supersede applicable provisions of federal, state, or local laws or regulations. [Occupational Safety and Health Administration \(OSHA\) Regulations; Standard Number 29 CFR 1926](#) are the foundation of these Guidelines.
- C. Deliverables
  - 1. Competent Person Designation (see attached form) (4.0/C)
  - 2. Verification of OSHA 30 or OSHA 10 compliance, based on project requirements. (4.0/D/1/b)
  - 3. Contractor Site Specific Safety Plan (SSSP). (4.0/I)
  - 4. Summary of the Daily Safety Inspections documented as part of regular project meeting minutes. For projects bid through Construction Services summaries of Daily Safety Inspections will be documented as agreed upon at the pre-construction meeting. (4.0/F/1)
  - 5. Regular (min. monthly) Safety Reports. (4.0/F/2)
  - 6. Traffic Control Plans (when impact exists) (4.0/QQ/1)

### 3.0 Reference Materials

- A. The following reference materials are required to be available upon request at every job site:
1. OSHA Regulations published by NC Department of Labor (DOL) (Available at (800) NC-LABOR, <http://www.nclabor.com/pubs.htm>).
  2. Safety Data Sheets (SDS) for all chemical products the contractor has brought to the worksite.
  3. The written Safety Plan of the Contractor or Subcontractor.
  4. Site inspection documentation.
  5. Worksite employee training records.
  6. Mishap reports and investigations.

### 4.0 General Responsibilities

- A. The contractor must notify the NC State Project Manager in writing at least 10 days prior to:
1. Utilizing powder-actuated tools
  2. Starting operations that will produce excessive odor, dust, and noise affecting occupied buildings or work near air intakes
  3. Using a combustion engine indoors
  4. Using a mobile crane or tower crane (50-day notice is required)
  5. Breaking ground for an excavation or trench
  6. Using a laser
  7. Using any source of radioactive material
  8. Working with lead or asbestos-containing materials
  9. Performing energized electrical work
  10. Working on or near active underground utility infrastructure (steam, chilled water, natural gas, water, etc.)
  11. Entering electrical distribution assets

**Violation of any safety, security, or environmental requirement may result in the permanent removal of the contractor or their employees from the NC State premises.**

- B. Construction Management
1. The contractor is responsible for compliance with all federal, state, and local laws, regulations, standards, executive orders, etc. applicable in part or whole pertaining to the scope of work.
  2. Contractors are responsible for compliance with all applicable NC State safety practices, procedures, policies, standards, and requirements.
  3. Contractors are responsible for providing qualified and competent personnel to perform activities under the scope of work. Contractors must provide documentation of training prior to beginning work on-site.
  4. Contractors are responsible for ensuring that subcontractors, their agents,

employees, visitors, and other persons performing portions of the work on a project comply with federal, state, and/or local laws or regulations that relate to work site safety.

5. Contractors are responsible for ensuring that subcontractors are informed of and comply with all applicable requirements within the scope of work.

#### C. Competent Person Designation

1. Contractors shall designate a competent person for activities as specified in OSHA 29 CFR 1926. Such activities include, but are not limited to, the following activities, as applicable to the job:

- a. general provisions
- b. ionizing/non-ionizing radiation
- c. gases, vapors, fumes, mists, dust
- d. ventilation
- e. hazard communication
- f. lead
- g. asbestos
- h. personal protective equipment
- i. hearing conservation
- j. respiratory protection
- k. rigging and material handling equipment
- l. welding, cutting, brazing
- m. electrical
- n. scaffold
- o. fall protection
- p. cranes (overhead and mobile)
- q. motor vehicles and equipment
- r. excavations
- s. concrete and masonry
- t. steel erection
- u. demolition
- v. stairways and ladders
- w. toxic and hazardous substances.

2. OSHA 29 CFR 1926.32(f) "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

#### D. Contractor Safety Personnel

1. Safety Representative
  - a. For all projects contractors must designate a Safety Representative prior to the start of the project. The Safety Representative may be the Project Superintendent and is responsible for all safety concerns related to the construction operations.
  - b. For formally contracted projects (>\$500k), the Safety Representative must have completed, at a minimum, an OSHA 30-hour Construction

Safety Course. For informally contracted projects (<\$500k), the Safety Representative must have completed, at a minimum, an OSHA 10-hour Construction Safety Course.

- c. The Safety Representative must actively monitor the job site for safety issues on a daily basis. The Safety Representative may have additional site duties outside the scope of safety; when the safety representative is not on the project site, a competent designee must be assigned to monitor safety on the site.

## 2. Safety Professional

- a. **When appropriate, the contractor shall provide a full-time safety professional assigned to the project. The duties of the full-time safety professional must be strictly limited to safety-related activities, with no additional job site duties.**
- b. Safety professionals must have one or more of the following credentials: a professional certification (beyond an OSHA 30-hour course), a college or professional degree related to safety and health, or significant previous experience and skills necessary to thoroughly understand the health and safety hazard and controls relevant to the project. The designation and adequacy of qualifications of the full-time safety professional shall be reviewed and accepted by the University prior to the commencement of the work.
- c. Project-specific requirements for a full-time safety professional will be addressed in the contract documents and discussed during the Pre-Bid Meeting.

## E. Daily Pre-Job Meetings

1. A pre-job meeting (i.e. "Tailgate" or "toolbox" meeting) shall be held at the beginning of each work period (normally in the morning before leaving the yard or work staging area). The pre-job meeting should include a discussion of the scope of work to be completed, associated hazards, and means and methods to mitigate the hazards. The pre-job meeting must be led by the supervisor or other competent person.

## F. Safety Inspections

1. Daily Inspections: The Contractor shall perform daily job inspections and correct any unsafe conditions or actions. A summary of these inspections will be reviewed as a portion of and captured in the minutes of the weekly Owner, Designer, and Contractor job meetings.
2. Monthly Inspections: For projects with a duration of more than one calendar month (4 weeks), the safety inspection must be documented and include, at a minimum, the name of the person performing the inspection, the date, a checklist of items observed, any identified safety concerns, and actions taken to address identified concerns.
3. University Project Visits: The NC State Project Manager, or another owner representative, may perform unscheduled visits to project sites to address adherence to the Contractor Safety Requirements or Site-Specific Safety

Plans. Any safety concerns identified will be reported to the responsible contractor for prompt mitigation.

- G. Mishap Reporting: All mishaps occurring on the project site must be investigated to determine causes and actions must be taken to prevent recurrence. Mishaps resulting in a recordable injury requiring medical treatment or damage to NC State property must be reported in writing to the NC State Project Manager as soon as possible but no later than 24 hours from occurrence; the Project Manager shall be notified immediately of mishaps resulting in life-threatening injury.
- H. The Contractor shall address safety concerns at regularly scheduled meetings with subcontractors.
  - 1. Contractor Site-Specific Safety Plan (SSSP) - The Contractor must develop and implement an SSSP. The SSSP is a comprehensive safety plan for his or her employees, which covers all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project-specific requirements. The SSSP must be submitted to, reviewed, and accepted by NC State before beginning any on-site work activities.
  - 2. As applicable to the project, these items must be included in the SSSP:
    - a. Scope of Work
    - b. Emergency Procedures
    - c. 24-hour emergency points of contact
    - d. Identification of Designated Competent On-Site Personnel (per OSHA requirements)
    - e. Designated On-Site Safety Personnel
    - f. Safety orientation program
    - g. Site logistics Plan: address public (student, faculty, staff, visitor) safety, traffic plan, equipment and lay-down areas, site security, dust containment, etc.
    - h. Minimum PPE requirements
    - i. Hazard Assessment (for defined project tasks) - include hazard identification and mitigation
    - j. Mishap reporting and investigation procedures
    - k. Safety inspection/audit procedures
    - l. Sub-contractor requirements

## 5.0 General Requirements

- A. Asbestos - If asbestos-containing materials are uncovered during construction, NC State must be notified immediately. Do not attempt to remove the material. Contractors shall comply with provisions of the [State Construction Office Asbestos Abatement Guidelines and Policies](#) and the [NC State Asbestos Management Plan](#).
  - 1. If asbestos-containing material is present in any building material and is in good condition (i.e. non-friable) and will not be disturbed during construction, the material may be left in place. If asbestos-containing material is disturbed during construction activities, then it shall be removed; removal shall be performed by appropriately qualified and accredited personnel and in accordance with federal, state, and local regulations.



- B. Compressed Gas Cylinders
1. Compressed gas cylinders shall be properly used, stored, and maintained as per federal, state, and local requirements.
  2. Cylinders shall not be stored in a location in which they are subject to mobile equipment traffic (including vehicles) unless adequately protected.
- C. Confined Space Entry
1. Contractors required to enter a confined space at NC State must have and implement a written confined space entry program in accordance with OSHA 1926 Subpart AA Confined Spaces in Construction or OSHA 1910.146 permit required confined spaces, as applicable.
  2. Controlling contractors (those with overall responsibility for construction at the work site) must ensure space entry coordination when more than one entity enters the space.
  3. Each contractor must have a competent person who will identify confined spaces associated with the scope of their work. Before entry into a permit-required confined space, contractors must obtain the following information from the controlling contractor (when there is no controlling contractor, the contractor will obtain the information from the NC State Project Manager):
    - a. The location of each known permit space associated with the project scope;
    - b. The known hazards or potential hazards that make it a permit space;
    - c. Any precautions needed to be taken based on the known hazards or potential hazards.
  4. Each contractor performing work in a permit space must perform a hazard assessment specific to the work to be performed and establish corresponding hazard controls.
  5. A competent person from each contractor performing work in a permit space must complete and sign [Appendix F](#) to the [NC State Confined Space Entry Program](#).
- D. Contaminated Soil - If soil or any materials appear to be contaminated, the NC State Project Manager must be notified immediately. The NC State Project Manager will contact NC State EHS for assistance at (919) 515-7915.
- E. Electrical Power Lines (Overhead) - The contractor shall have a trained and knowledgeable observer (signal person) within sight of the operator and the overhead lines that will effectively provide guidance and clearance information to the operator as the equipment may approach the minimum approach distances. Advising the operator shall be the signal person's one and only task. When conducting any work with a crane, derrick, or hoist in the vicinity of any overhead electric power transmission or distribution line, the contractor shall observe all clearance requirements dictated by all applicable OSHA rules, as specifically contained within 29 CFR 1910 - Standards for General Industry, CFR 1926 - Standards for Construction, IEEE C2 - NEC, NFPA 70 - NEC, the NCSBC, ANSI standards, and other applicable NC State safety guidelines and requirements. Further, no crane, derrick, or hoist operator or contractor shall conduct any operation at any distance closer than 20 feet to any electric power line lower than 200 kV or closer than 35 feet to any electric power transmission line at voltages higher than 200 kV and lower than 250 kV, unless the requirements of OSHA 1926 Sub CC for preventing encroachment/electrocution are strictly followed.
- F. Elevators/Material Hoists
1. Any persons operating elevators/hoists must be trained to do so. Documentation

- shall be kept onsite.
2. No elevator/hoist with a defect shall be used.
  3. Elevator/hoist safety devices shall not be overridden or made inoperable.
- G. Emergency Equipment- The following shall not be moved, blocked, disabled, or rendered inaccessible unless authorized by NC State:
1. Fire equipment
  2. First aid equipment, fire blankets, stretchers, eyewash fountains, and safety showers
  3. Fire protection, hydrants, and detection systems
- H. Emergency Medical Treatment - To receive immediate assistance for emergency medical treatment call 911.
- I. Environmental and Chemical Requirements
1. Contractors must provide NC State with a list of all chemicals to be used on NC State property and maintain a copy on-site of the SDS for each chemical prior to being brought on-site. Each chemical container must be labeled clearly with the identity of the chemical and any associated hazards in accordance with the OSHA Hazard Communication Standard (1910.1200).
  2. Contractors must follow the safety procedures recommended by the manufacturer or seller of any chemicals, tools, equipment, or other materials. Contractors are to remove all empty containers, excess chemicals, and chemical waste from NC State property.
  3. For all chemical incidents, contractors shall call 911 and also notify the NC State Project Manager.
- J. Excavation and Trenches - Before doing any excavation work, the Contractor must locate all utilities by calling the local utility locator service and NC State.
- K. Excavations
1. Underground Facilities Locate. Contractors shall ensure underground installations and facilities are identified by calling 811 (Call Before You Dig) before performing any excavating activity. Note: excavation includes movement or removal of earth, rock, or other materials in or on the ground by use of manual or mechanized equipment. This is required for any project with earth-moving activities before you dig so that underground facilities can be identified and avoided. Detailed instructions and requirements can be found at [nc811.org](http://nc811.org).
  2. Competent Person. Trench and excavation work must be performed under the direction of a competent person. Responsibilities include: classifying soil, inspecting protective systems, monitoring water removal, and conducting site inspections.
  3. Cave-In Protective Systems. A protective system is required by OSHA-1926 Subpart P for trenches and excavations that are 5 feet or more in-depth OR if the competent person has examined the ground and finds an indication of a potential cave-in. Protective systems typically include sloping/benching, shoring, or shielding. To determine what protective systems are appropriate, the competent person must first determine the soil type: Stable Rock, Type A, Type B, or Type C soil. Type C soil is the least cohesive and therefore, the least stable. No work shall be permitted in excavations where water has accumulated unless the integrity of the excavation has been protected.
  4. Excavations >20 feet in depth or that cannot comply with OSHA requirements require written approval by a Registered Professional Engineer (RPE).
  5. A ladder, stairway, ramp, or other means of access must be provided within the excavation when excavations are >4 feet in depth.

6. Barricades (stop-logs) shall be provided where vehicles or mobile equipment are used near or adjacent to excavations.
  7. Spoil piles must be placed a minimum of 2 feet from the edge of the excavation.
  8. Air monitoring must be performed if the excavation is >4 feet in depth and there is a potential for a hazardous atmosphere to exist.
- L. Exit Routes
1. Exit routes must be maintained at all times during construction.
  2. Lighting and marking must be adequate and appropriate.
  3. Exit routes must be kept free of explosive or highly flammable furnishings.
  4. Exit routes must be free and unobstructed. No materials or equipment may be placed, either permanently or temporarily, within the exit route. The exit access must not go through a room that can be locked, such as a bathroom, to reach an exit or exit discharge, nor may it lead into a dead-end corridor. Stairs or a ramp must be provided where the exit route is not substantially level. No materials shall be stored in a stairwell.
- M. Explosives: Blasting on university property is prohibited.
- N. Fall Prevention. A fall hazard is any condition on a walking-working surface that exposes an employee to a risk of a fall on the same level or to a lower level. Examples of fall hazards include, but are not limited to: floor openings, hoist areas, roofs, leading edges, scaffolding, ramps, etc.
1. Preventing or protecting falls from height may be necessary at any height given the circumstances, but is required when an employee is at a height of 6 feet or more above a lower level.
  2. Contractor work generally falls within construction industry applications, where acceptable methods depend on the type of work being performed: unprotected sides or edges, roof work, leading edge, etc. In all cases, contractors shall comply with the respective OSHA standards.
  3. Contractors shall ensure that every employee required to work at unprotected heights (greater than 6 feet) is trained in fall hazard recognition and prevention.
  4. **Guardrail System.** A guardrail system provides the highest level of protection and is always preferred. The system must be capable of supporting 200 lbs. in any direction and still maintain its integrity. The individual heights of the components must conform to the following minimum standards:
    - a. The top rail of the system must be at a height of 42" (+ or - 3");
    - b. the mid rail must be at a height of 21" with a 3" variation possible;
    - c. the toe board must have a minimum vertical height of 3.5".Note: The building code has more stringent requirements for permanent installations.
  5. **Personal Fall Protection Systems.** At times, it is necessary to work in areas where guardrails cannot be constructed; in these instances, a personal fall protection system must be used. Personal Fall Protection Systems are systems (including all components) that provide protection from falling or that safely arrest a fall. Examples include travel restraint and personal fall arrest. All components of this system shall meet the applicable design requirements as specified in OSHA 1910, 1926, or ANSI Z359. All components shall be inspected by the wearer prior to each use and at least annually by a competent person. No employee may use a personal fall protection system without proper training and an understanding of proper use and safe application of the system.
    - a. **Travel Restraint System.** A travel restraint system is a combination of an

anchorage, anchorage connector, lanyard (or other means of connection), and body support that the wearer uses to eliminate the possibility of going over the edge of a walking-working surface. Anchorages for travel restraint systems shall have a strength capable of sustaining static loads of at least 1,000 lbs. (per person) or two times the foreseeable forces for certified anchorages. Anchorage connectors, lanyards (or other means of connection), and body support devices shall be used in accordance with the manufacturer's requirements. The system shall be installed so that a fall cannot occur; therefore, a rescue plan is not required.

- b. **Personal Fall Arrest System.** A personal fall arrest system is a system used to safely arrest a user in a fall from a walking-working surface. It includes an anchorage, anchorage connector, and a full-body harness. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these. Equipment must be worn and used in accordance with the manufacturer's requirements. Anchorages for personal fall arrest systems shall have a strength capable of sustaining static loads of at least 5,000 lbs. (per person) or two times the maximum arresting force for certified anchorages. The system shall be installed so that should a fall occur, the wearer will not contact the lower level or any other obstruction. Since there is a potential for a fall to occur, a rescue plan written by a qualified person is required.
- c. **Warning Line System.** A warning line may be used for construction roofing work when closer to the fall hazard than 15ft, but no closer than 6ft and in conjunction with one of the following: a guardrail system, a safety net system, a personal fall protection system, or a safety monitoring system. A warning line system shall conform to regulatory requirements and enclose all authorized employees conducting work protected by the Warning Line System. Refer to OSHA 1926.502(f).

O. Fire Protection and Prevention

- 1. The contractor shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction. Contractors shall perform inspections on fire extinguishers monthly. Contractors shall immediately replace fire extinguishers that do not pass inspection.
- 2. Fire cutoffs shall be retained in buildings undergoing alterations or demolition until operations necessitate their removal.
- 3. If work requires the disabling of Fire Protection Devices, then the Contractor must request a Fire Alarm Disconnect; through the appropriate NC State process; beginning with the Project Manager. No alarm shall be disabled at any time by the Contractor.

P. Hand and Power Tools

- 1. All hand and power tools and similar equipment, whether furnished by the employer or the employee, shall be maintained in a safe condition. Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.
- 2. All tools shall be used, operated, and maintained in accordance with OSHA and manufacturer requirements.

Q. Hot Work Permits - A Hot Work Permit is required when any indoor or outdoor work will involve hot work, defined as operations including cutting, welding, thermite welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of

torch-applied roof systems or other similar activities. Requirements for Contractors performing this work are contained in the NC State Hot Work Permit Program which is a part of the specifications package and can also be found in the [Hot Work Permit Form](#).

R. Housekeeping

1. The Contractor must maintain a clean and orderly project job site. The Contractor shall maintain NC State's pathways free of rocks, mud, and other miscellaneous construction debris. The Contractor shall prevent the accumulation of dirt, dust, and/or other debris on NC State's roadways. The Contractor shall clean the travelways on a daily basis. (Refer to project specifications for requirements.)
2. Waste material and debris must be removed from the work and access areas at least once a day. Waste material and debris should not be thrown from one level to another but should be carried down, lowered in containers, or deposited in a disposal chute.
3. Materials must be neatly piled, stacked, or otherwise stored to prevent tipping or collapsing. Materials must be carefully stacked and located so they do not block aisles, doors, fire extinguishers, safety showers, eyewash stations, fixed ladders, or stairways.
4. Material to be lifted by crane or other hoisting devices must not be stored under overhead power lines.
5. No materials may be stored on penthouses, roofs, or other areas until a specific area is assigned by NC State for a specific project.
6. Adverse Weather: If NC State becomes aware of an adverse weather event, the NC State Project Manager shall notify the construction superintendent, and the contractor shall perform a job site review to ensure any debris or construction materials are secured and protected from the elements.

S. Illumination - Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be lit to not less than the minimum illumination intensities required by OSHA.

T. Ladders - All ladders must meet OSHA requirements.

U. Lasers

1. Lasers must comply with the OSHA Construction Industry Standards.
2. Lasers must be low-power (<5mw) devices with visible beams. Lasers to be used must bear a label indicating this maximum power output. Lasers that do not bear this label shall not be used.
3. "Laser in use" signs shall be posted according to OSHA requirements.
4. Lasers must be used in a manner that will not risk exposure to others.

V. Lead

1. Lead may be found in certain painted surfaces. A check for lead presence should be conducted prior to certain activities such as grinding, sanding, or burning over painted surfaces. If lead-containing paint is disturbed or a material is questionable the NC State Project Manager must be notified immediately. Do not attempt to remove the material.
2. Hot Work over lead-painted surfaces is generally not permitted.

W. Lock Out/Tag Out

1. All contractors that work on energized equipment with any hazardous energy source are required to have a hazardous energy control (i.e. lockout tagout) program. The program shall specify policies and procedures for de-energizing, verifying de-energizing, and securing the source potential using energy isolating devices and applying locks/tags or implementing other forms of hazardous

- energy control as specified in OSHA standards. Types of potential energy sources include, but are not limited to:
- a. Electrical (refer to the section of these requirements titled "Electrical")
  - b. Pneumatic
  - c. Hydraulic
  - d. Thermal
  - e. Kinetic (motion)
  - f. Hazardous gas, liquid, air
  - g. Radiation
  - h. Lasers
2. When multiple contractors are performing work on the same project, hazardous energy control procedures shall be coordinated by the controlling entity which includes establishing device standardization.
  3. Contractors shall ensure site personnel are trained on the hazardous energy control program.
  4. Central [Utility Plant \(CUP\) - Lockout Tagout Procedure](#)
    - a. Contractors with the need to perform LOTO operations within the operating CUP shall be trained in accordance with the procedure and comply with applicable sections of the procedure. The contractor is responsible for providing this training; a copy of this procedure will be provided to the contractor.
    - b. Contractor management shall ensure that authorized personnel are assigned to perform work in which they are qualified.
    - c. Contractor management shall comply with applicable sections of the procedure.
- X. Mobile Cranes, Tower Cranes, etc. (Reference OSHA 1926 Subpart CC).
1. Prior to the setup or operation of any crane on university property, the NC State Project Manager (or another point of contact) shall be notified; notification must be made with as much lead time as possible, but no fewer than fifty (50) working days
  2. Cranes shall be set up and operated in compliance with the manufacturer and applicable OSHA requirements.
  3. Contractors are responsible for ensuring ground conditions are capable of supporting the equipment and load, which will include performing underground facilities/utilities location (i.e. 811 calls) as well as factual confirmation of necessary compaction capacities. This confirmation is to be by third-party inspection services, at the expense of the contractor.
  4. No lifts may occur over occupied spaces unless a registered structural engineer evaluates and certifies that the building can withstand the impact of a load being dropped on the building as a worst-case scenario. If it is determined that the building cannot withstand the impact without compromising the structure, areas of the building within the load fall zone must be evacuated during the duration of the lift. This evacuation process must be a part of the lift plan and managed by the contractor.
  5. The crane contractor shall provide equipment documentation, including the annual inspection and the last monthly inspection. Documentation must be signed.
  6. Crane operators shall be certified by an Accredited Crane Operator Certification Agency for the type of equipment operated. Examples of such agencies, include, but are not limited to:

- a. National Commission for the Certification of Crane Operators (NCCCO)
- b. National Center for Construction Education and Research (NCCER)
- c. Operating Engineers Certification Program (OECF)
- d. Electrical Industry Certifications Association (EICA)

Additionally, the crane operator's employer must attest that the operator was evaluated to verify the operator demonstrates skills and knowledge to safely operate the equipment as well as the ability to recognize and avert risk, as required under 29 CFR 1926.1427 (f).

7. All rigging personnel and signal persons shall be qualified in accordance with OSHA 1926 Subpart CC.
8. Crane Lift Plan. A lift plan is required for any lift in a location not under the exclusive control of the contractor, including lifts affecting NC State property, structures, employees, students, or visitors. Each lift plan must be developed by a qualified person and include at least the following:
  - a. The identity of the controlling entity, meaning the employer with the overall responsibility for construction operations associated with the crane lift.
  - b. Identify a lift director (i.e. primary signal person) and method of communication (hand signals, radio, etc.).
  - c. Contractors conducting crane operations are required to obtain required FAA permits according to 14 CFR Part 77; to be submitted with the lift plan.
  - d. Equipment positioning locations, including load staging and movement and paths to and from the working position.
  - e. Equipment specifications including load and reach capacities.
  - f. Current qualifications, certifications, and licenses of operators and riggers.
  - g. For lifts involving more than one crane, the lift plan shall encompass all cranes.
  - h. Fall Zone: The contractor shall identify the Fall Zone. The Fall Zone is the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall. Spaces within the Fall Zone (including buildings, foot traffic, vehicle traffic, etc.) shall be barricaded to control access. The Fall Zone shall be cleared of personnel not participating in the lift.
  - i. Wind limitations.
  - j. Ground and subsurface stability at crane and load placement locations. The contractor must ensure a qualified person evaluates the crane set-up location to ensure ground conditions are sufficient. (See X., 3. above).
  - k. Other conditions or factors that may affect the safety of the lift.
  - l. A pre-lift meeting must be completed immediately before the lift and shall include all personnel involved with the lift and a thorough review of the elements and specifics of the lift plan and personnel assignments.
  - m. Specify the distance to the closest energized lines and the applicable minimum approach distance of any lift component.
  - n. Where items positioned by a crane lift are rigged at heights above easy reach height, the lift plan shall include safe attachment and de-attachment

procedures and the control of exposure to fall hazards.

- o. The contractor must provide documentation of annual and monthly inspections for the previous 3 months. 1926.1412(f) & .1412(e).

Y. Electrical

1. Electrical Contractor shall ensure that their personnel using electrically powered equipment are trained to recognize electrical hazards, inspect and maintain electrically powered equipment, and on safe work procedures to prevent exposure to electric shock.
  2. Premises Electrical Equipment. All electrical installations must comply with the National Electrical Code® (NEC®). Work associated with electrical equipment installed in accordance with the NEC® will be conducted in accordance with the NFPA 70E® Standard for Electrical Safety in the Workplace. NC State's goal is to minimize exposure to shock and arc flash hazards during the installation, repair, maintenance, and operation of electrical equipment, components, and systems.
    - a. Electrical power sources shall be de-energized, verified, and locked out prior to working on electrical equipment except when de-energization creates a greater hazard and a properly executed Energized Electrical Work Permit (EWP) has been completed.
    - b. Contractors performing electrical work must have their own energized electrical work program that includes a permit process.
  3. Power Generation & Distribution: Work by Qualified Persons and Unqualified Persons working on or near power generation or distribution equipment is addressed in OSHA 29CFR1910.269. It includes work on or directly associated with installations used for the generation, control, transformation, transmission, and distribution of electricity. Any work involving the NC State distribution system shall be coordinated by the NC State Project Manager (or other university contact person) in collaboration with the Facilities Division Power Systems group.
    - a. Work involving the NC State electrical distribution system shall only be performed after authorization by the Facilities Division Power Systems group in accordance with the Power Systems Switching Procedure.
    - b. System Check-In/Out: Prior to entering any primary enclosure (substation, transformer, manhole, switch, switching station, etc.) of the NC State Power System the NC State Project Manager or other designated person shall send a text or email to group-powersystementry@ncsu.edu with the work location and brief description of the tasks to be performed (photos are welcomed). When exiting the enclosure, check out with NC State Power Systems using the same method. This is only for unescorted access. For example, if you're with a member of the Power Systems team there's no need to check in/out, but if that team member has to leave your work site, you're expected to check in and check out.
  4. The contractor will follow all requirements as noted in NFPA 70E.
- Z. Mobile Elevating Work Platforms (MEWPs)
1. General Requirements.
    - a. MEWPs shall be operated in accordance with the manufacturer's requirements and specifications.
    - b. Employees must always stand firmly on the floor of the MEWP and must not sit or climb on the edge of guardrails, or use planks, ladders, or other devices for a work position. The guardrail system of the platform must not



- be used to support materials, other work platforms, or employees.
- c. A personal fall arrest/restraint system shall be used in accordance with the manufacturer's requirements. A scissor lift with approved guardrails may be used without a personal fall arrest system when specified by the manufacturer, however, if there are designated anchor points, the use of a fall arrest/restraint system is required.
  - d. The MEWP must be used only in accordance with the manufacturer's operating instructions and safety rules.
  - e. The designed rated capacity for a given angle of elevation must not be exceeded.
  - f. At least 10 ft distance must be maintained away from overhead power lines with a nominal voltage of 50kV or less; 20 ft for power lines over 50kV (or if the voltage is unknown). Note: qualified workers using appropriately insulated MEWPs may approach closer than 10 ft when following provisions specified in OSHA 1910.268, 1910.269, and 1926 Subpart V, as applicable.
  - g. The manufacturer's rated load capacity must not be exceeded. The load and its distribution on the platform must be in accordance with the manufacturer's specifications. The rated load capacity must not be exceeded when loads are transferred to the platform at elevated heights. Only employees, their tools, and necessary materials must be on or in the platform.
  - h. A trained spotter with no other job duties is required when a MEWP is driven; the spotter will assess conditions that could pose a hazard to the operation (for example, drop-offs, holes, slopes, inadequate surface and support, obstructions, pedestrians, vehicles, debris, electric lines, etc.) and stop operations and alert the operator. The operator shall halt operations until hazards are adequately controlled.
2. Training
    - a. Only personnel who have received training to operate the specific type(s) of MEWPs are authorized to operate them on NC State property.
    - b. Training must include inspection, application, and operation of MEWPs (including recognition and avoiding hazards associated with their operation). Operators are only authorized to use MEWPs of the specific model for which they are trained and evaluated.
    - c. Training must be provided by a person who has knowledge regarding the laws, regulations, safe use practices, manufacturer's requirements, and recognition and avoidance of hazards, and is familiar with the specific type(s) of MEWPs. Note: Personnel may not operate rented equipment unless qualified to operate the specific equipment; the rental provider or other authorized evaluator must provide familiarization training to satisfy this requirement.
  3. Inspection, Maintenance, and Testing
    - a. Each MEWP must be inspected, maintained, repaired, and kept in proper working condition in accordance with the manufacturer's operating or maintenance and repair manual or manuals. Maintenance inspections shall be completed at intervals no less frequent than annually.
    - b. Before use, visual equipment inspections and a functional check must be performed before each shift in accordance with the manufacturer's operating manual. Any MEWP found not to be in a safe operating

condition must be removed from service until repaired. All repairs must be made by an authorized person in accordance with the manufacturer's operating or maintenance and repair manual or manuals.

- c. Before and during use, visual worksite inspections must be performed and include workplace risk assessment. The workplace risk assessment includes identifying and evaluating hazards (for example, drop-offs, holes, slopes, inadequate surface and support, obstructions, pedestrians, vehicles, debris, electric lines, etc.) and establishing effective control measures. Uncontrolled hazardous situations must be corrected prior to the initial or continued use of the MEWP.

AA. Noise/Vibration

1. Noise-producing equipment, such as power drills, jackhammers, welders, etc., can create sound levels of 80dB(A) or greater in and around a construction area. Notify the NC State Project Manager in advance to determine the appropriate times to operate high noise/vibration equipment for that project's location.
2. Appropriate personal protective equipment shall be used when working around high-noise/vibration equipment.

BB. Overhead Work

1. Work must not be performed above other personnel, including other contractor employees. Affected areas must be roped off or barricaded and marked to prohibit traffic.
2. Contractors must not climb on the heating and air-conditioning ductwork, plumbing steam piping, sprinkler piping, electrical cable trays, fixtures, or furniture or use as work platforms.
3. Contractors are expected to comply with OSHA fall protection requirements.

CC. Paints and Solvents - Contractors must provide the following safeguards:

1. Adequate ventilation must be maintained at all times when paints or solvents are being used. Refer to [NC State Odor Prevention and Dust Control in Occupied Buildings](#) for additional information.
2. Contractor personnel must use proper respiratory protection and protective clothing when the toxicity of the material requires such protection.
3. Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
4. Flammable paints and solvents must be stored in an approved flammable liquid storage cabinet when storage is required inside buildings. Acids and flammables must never be stored together. If an approved flammable liquid storage cabinet is not available, flammable paints and solvents must be removed from the building.
5. Flammable liquids must be dispensed in a safety can with a flash screen bearing a Factory Mutual or Underwriters Laboratory (UL) approval.

DD. Personal Protective Clothing and Equipment - The contractor shall determine this minimum level of protective equipment to be worn on the job site (example: hard hat, eye protection, safety vest, gloves, and safety shoes); NC State expects contractors to conform to industry accepted minimum PPE standards, for example, hard hats, safety glasses, and protective toe footwear. Any additional safety equipment required by a specific activity shall also be worn and shall meet or exceed OSHA standards. This applies to ALL persons entering the job site.

EE. Powder-Actuated Tools

1. Powder-actuated tools are not to be used on NC State property unless specific approval is obtained from NC State prior to usage.
2. If approved, powder-actuated tools must be used in accordance with OSHA and

manufacturer regulations.

FF. Power Vehicle Equipment

1. Only trained operators are allowed to use power vehicles on NC State property. Contractor management will be expected to provide proof of training if requested.
2. Generally, LP gas-powered trucks are not to be used inside NC State buildings. Prior approval from NC State is required.
3. The design of the LP gas-fueled industrial truck for use within NC State buildings must comply with the following:
  - a. LP gas-fueled industrial trucks must comply with NFPA 505-1982.
  - b. If trucks are in continuous use in a populated area, they must be equipped with a catalytic converter.
  - c. LP gas containers must not exceed the nominal 45 pounds of LP gas.
4. The following conditions and requirements will govern the use of LP gas-fueled vehicles inside the confines of NC State buildings and structures:
  - a. LP gas-fueled trucks must be removed from the building and parked at the end of each workday and not left unattended while in use. When the job requiring the vehicle is complete, the vehicle must be removed from the job site.
  - b. Trucks and tanks must not be refueled inside buildings.
  - c. All areas where LP gas-fueled trucks are used must be well ventilated.
5. All LP cylinders must be stored outside and secured by a chain in an upright position.

GG. Roof Safety

1. The contractor shall request authorization from NC State prior to accessing a roof.
2. During all rooftop operations, the contractor must provide fall protection measures in accordance with OSHA.
3. A Hot Work Permit and at least two appropriate fire extinguishers of the correct ABC type are required when performing hot work on roofs. Other persons acting as a Fire Watch shall be in place on the roof and on the floor(s) directly below the operation.

HH. Sanitation

1. Drinking Water - An adequate supply of water, meeting the U.S. Public Health Service Drinking Water Standards, shall be provided.
2. Washing Facilities
  - a. The contractor shall provide adequate washing facilities for employees engaged in the application of paints, coating, herbicides, or insecticides, or in other operations where contaminants may be harmful to the employees. Such facilities shall be close to the work site and shall be so equipped as to enable employees to remove such substances.
  - b. Hand soap or similar cleansing agents shall be provided.
  - c. Individual hand towels, cloth or paper, warm air blowers, or clean individual sections of continuous cloth toweling, shall be provided.
3. Toilet facilities shall be provided for employees according to OSHA requirements.

II. Scaffolding

1. The contractor shall erect, use, and dismantle scaffolding in accordance with OSHA and manufacturer regulations.
2. Competent Person. Scaffolds must be erected and dismantled under the direction of a competent person. Responsibilities include, but are not limited to:
  - a. supervise and direct scaffold erection, moving, dismantling, or alteration.

- b. determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Employers are required to provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.
      - c. inspect scaffold and scaffold components for visible defects before each work shift and after any occurrence that could affect a scaffold's structural integrity and ensure identified deficiencies are corrected,
      - d. determine if it is safe for employees to work on scaffolds during storms or high winds.
    3. Access. When scaffold platforms are more than 2 feet (0.6 m) above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stair towers (scaffold stairways/towers), stairway-type ladders (such as ladder stands), ramps, walkways, integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist, or similar surface shall be used. Cross Braces shall not be used as a means of access.
    4. Fall Protection. Each employee on a scaffold more than 10 feet (3.1 m) above a lower level shall be protected from falling to that lower level; each employee on a suspended scaffold shall be protected by a personal fall arrest system attached to an independent anchorage.
    5. Falling Object Protection. Where the potential for tools, materials, or other equipment could fall from a scaffold, the area below must be barricaded, and personnel not permitted to enter the area OR effective means shall be implemented to prevent objects from falling.
- JJ. Signs, Tags, and Barricades (references 1926 Sub G and ANSI Z535)
  1. Signs and Tags: Each sign and tag must include a signal word, symbol, and text.
    - a. Signal words:
      - (1) DANGER = the hazard will most likely result in serious injury or death;
      - (2) WARNING = the hazard could result in serious injury or death;
      - (3) CAUTION = the hazard would not likely result in serious injury or death;
      - (4) NOTICE = indicates important information, but is not directly hazard-related.Symbols or graphics are used to bridge language barriers and draw attention to the message.
    - b. Text is used to convey the safety message in a clear, concise manner.
  2. Barricades. Barricades must be installed for situations where a physical obstruction is necessary to deter the passage of people, vehicles, or equipment. When used, barricades must be installed at all points of access.
    - a. Barricades associated with traffic control in a public roadway must comply with the Federal Manual of Uniform Traffic Control Devices and the North Carolina Supplement. Coordinate with the NC State Transportation Office.
    - b. Barricades may take many forms on construction sites, but when used, they must clearly indicate the intent of the barricade. All barricades are required to include a sign that includes the name of the person responsible for the barricaded area, method for contacting the responsible person (ex. phone number), and clear and concise text describing the purpose of the barricade.

(1) CAUTION Tape Barricades should be used when the hazardous condition is not likely to cause serious physical harm but could result in injury. Standard CAUTION Tape must be used, which includes yellow tape with the word "CAUTION" in black letters. Personnel may enter the barricaded area only when implementing precautions to address the identified hazard.

(2) DANGER Tape Barricades are used when a serious or imminent danger may exist. Standard DANGER Tape must be used, which includes red tape with the word "DANGER" in black letters. Only personnel specifically authorized by the person responsible for the barricaded area may enter the barricaded area.

- KK. Silica (Respirable Crystalline Silica) – The following requirements apply to all operations involving exposure to respirable crystalline silica. Examples of such operations include: cutting, grinding, drilling, or crushing brick, block, concrete, stone, rock, mortar, and other materials that contain crystalline silica.
1. Contractors shall comply with OSHA standard 29 CFR 1926.1153 including taking all necessary steps to comply with the established exposure limits.
  2. Contractors must have a written Exposure Control Plan specific to their operations in accordance with 29 CFR 1926.1153 that includes specific details for controlling exposure to NC State personnel and the public. A copy of this plan shall be made available to NC State EHS and/or the university Project Manager upon request.
  3. Tasks performed indoors or in an enclosed area shall have effective exhaust ventilation to minimize the accumulation of visible airborne dust. In situations where ventilation is exhausted in an area with the potential to expose people to dust must incorporate effective HEPA filtration; such areas include but are not limited to, inside a building or outside where people may be present.
  4. When a building ventilation system services an area where work with the potential for generating respirable crystalline silica exists, the building air returns shall be blanked or closed while such work is in progress. Contractors must coordinate this with the university project manager.
  5. Contractors must establish a "Temporary Restricted Area" for tasks that require the use of respiratory protection in accordance with 29 CFR 1926.1153.
    - a. A *Temporary Restricted Area* is an area demarcated by the employer where an employee is required to wear respiratory protection.
    - b. *Temporary Restricted Areas* must be designated with signs, barriers, or other effective means that will ensure unauthorized persons do not enter.

If such work is performed in *occupied* buildings, dust barriers shall be installed as necessary to isolate the restricted area. Refer to [NC State Odor Prevention and Dust Control in Occupied Buildings](#) for additional information.

- LL. Smoking and Open Flames
1. Smoking is not allowed in any NC State buildings, including roofs, penthouses, electrical/mechanical rooms, and basements or within 25 feet of any building entrance or exit.
  2. The use of open flames is strictly prohibited in areas where flammable liquids, gasses, or highly combustible materials are stored, handled, or processed.
  3. The use of open flames, where allowed, requires a Hot Work Permit.

- MM. Tarpaulins - When tarpaulins are required for the deflection of hot slag, dust, paint drippings, etc., or as a security barrier, they must be flame resistant and in good condition, free of holes and worn edges.
- NN. Tar Pots (tar kettles) - Tar Pots are not allowed on roofs. The contractor must notify the NC State Project Manager prior to using tar pots and obtain a Hot Work permit.
- OO. Temporary Heating - When heaters are used in confined spaces, special care shall be taken to provide sufficient ventilation to ensure proper combustion, maintain the health and safety of workmen, and limit temperature rise in the area.
- PP. Temporary Lighting - The contractor shall submit a lighting plan for night work, underground work, and any other worksites without adequate lighting.
- QQ. Temporary Traffic Control
1. All traffic control shall be approved by NC State and meet the Institute for Transportation Research and Education (ITRE) Work Zone Safety Guidelines for Construction, Maintenance, and Utility Operations. A traffic control plan shall be provided by the contractor and approved prior to commencement.
  2. The contractor shall provide warning signs, barriers, barricades, etc., in accordance with the construction plans and specifications or whenever such protection is needed.
  3. Where signs and barricades do not provide adequate protection, particularly along a road, walkway, or main aisle, flagmen shall be used.
  4. Review with the crew, each person's responsibility regarding the traffic control set-up (e.g. sign installation, lane closure setup, etc.).
  5. Review traffic control devices to be used at the site. Assure that traffic control set-up is properly installed. The installer shall document what traffic control set-up was used (including the sign types and sign locations) and how it was installed.
- RR. Vehicle Operation
1. All equipment shall have operational backup alarms. Equipment shall not be utilized until such device is functioning properly.
  2. All vehicles shall be operated in accordance with OSHA and manufacturer regulations.
- SS. Vertical Lifts - All contractors' platforms or vertical lifts must meet OSHA and manufacturer requirements.

## SECTION 014000 – QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Designer, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
  - 1. Section 013100 "Project Management & Coordination" for requirements on the Construction Management Software that the Contractor will be utilizing to implement the Site-Specific Quality Program.
  - 2. Section 014339 "Mockups" for specific mockup requirements.
  - 3. Section 017300 "Execution" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 4. Divisions 02 through 49 Sections for specific test and inspection requirements.

## 1.2 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.

## 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Designer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

- D. **Product Testing:** Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. **Source Quality-Control Testing:** Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- F. **Field Quality-Control Testing:** Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. **Testing Agency:** An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. **Installer/Applicator/Erector:** Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. **Experienced:** When used with an entity or individual, "experienced" means having successfully completed a minimum of 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.
- J. **Professional Engineer:** Engineer currently licensed to practice in the State of North Carolina.

#### 1.4 CONFLICTING REQUIREMENTS

- A. **Referenced Standards:** If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Designer for a decision before proceeding.
- B. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Designer for a decision before proceeding.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. **Site-Specific 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 sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Designer.



2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Designer.
- 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. Description of test and inspection.
  3. Identification of applicable standards.
  4. Identification of test and inspection methods.
  5. Number of tests and inspections required.
  6. Time schedule or time span for tests and inspections.
  7. Entity responsible for performing tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- F. Testing Agency and Inspection Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  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. Ambient conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- G. 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, and telephone number 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.
- H. 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, and telephone number 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.
- I. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.6 CONTRACTOR'S SITE-SPECIFIC QUALITY PROGRAM
- A. Definitions:
1. Quality Assurance: The part of Quality Management focused on providing confidence that quality requirements will be fulfilled.
  2. Quality Control: The part of Quality Management focuses on fulfilling quality requirements. While quality assurance relates to how a process is performed, quality control is more the inspection aspect of quality management.
- B. General:
1. Submit Contractors Site-Specific Quality Program including all components herein not less than five days prior to preconstruction conference. Submit in format acceptable to Designer and Owner.
  2. Contractors Site-Specific Quality Program must be specifically tailored to the work of the project. While a corporate Quality Manual may be submitted to supplement, or as a reference to, the Site-Specific Quality Program, the submission of a corporate Quality Manual without specific tailoring to the needs of the project will be rejected.
- C. Quality Assurance:
1. Goals & Objectives, including key milestones for the project.
  2. Roles & Responsibilities of Project Personnel, including an Organization Chart and Resumes of individuals.
  3. Description of the Project Management / Document Control Software / Quality Control Software(s) to be utilized on the project.
  4. Define the Projects Definable Features of Work (DFOW).
    - a. **[To be completed by Designer & Owner during Design Phase]**
    - b. Contractor is encouraged to define additional DFOW's as they see fit to ensure that the quality requirements of the Project Documents is successfully delivered.
  5. Describe the BIM coordination process to be followed.
  6. Describe the Preconstruction / Bidding process.
  7. Describe procedures for ensuring compliance with requirements through review and management of submittal process.
- D. Quality Control:

1. Construction: 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.
  2. Inspections & Testing: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
    - a. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include the following:
      - 1) Tests and inspections required in the Contract Documents.
      - 2) Contractor-elected tests and inspections (i.e. first-in-kind installations, material delivery inspections, weekly jobsite walks, etc.)
      - 3) Mockups
    - b. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
    - c. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
  3. Describe the process for Correction of Deficiencies.
  4. Submit Documentation Templates to be used by the Contractor during the Project to ensure quality requirements are being met. Include at a minimum, the following:
    - a. Daily Reports Template.
    - b. Inspection & Testing Report Forms.
    - c. Inspection checklist templates.
    - d. Material receiving reports.
  5. Describe the process for the control of Quality Records.
    - a. Maintain testing and inspection reports including log of approved and rejected results. Include work Designer 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.
  6. Describe the startup process for equipment, include relevant forms to ensure work is complete prior to attempting startup.
  7. Describe the Contractor's Commissioning plan, including identifying personnel responsible for coordinating with Owner's Commissioning Party.
- E. Closeout & Project Acceptance:
1. Describe the process for completing the following items as part of the Closeout & Project Acceptance Phase. Provide draft checklists as applicable.
    - a. Contractors Completion List
    - b. Designer & Owner Punch List
    - c. Owner's Training
    - d. O&M Manuals
    - e. Attic Stock
    - f. NC State Final Acceptance Checklist

- g. SCO Final Inspection Checklist
- h. Warranty Phase

## 1.7 QUALITY ASSURANCE

**[Coordinate items in this section with Designer during Design Phase. Delete unnecessary requirements as determined by Division 02 through 33.]**

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Fabricator Qualifications: A firm experienced and expert in producing products similar to those indicated for this Project and with a three-year record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. 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.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a three-year record of successful in-service performance.
- E. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a five-year record of successful in-service performance.
- F. 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.
- G. Professional Engineer Qualifications: A professional engineer 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 products that are similar to those indicated for this Project in material, design, and extent.
- H. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- I. Testing Agency Qualifications: An NRTL, an NVLAP-accredited, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- 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 and assemblies 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. Fabricate and install test assemblies and mockups using installers who will perform the same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, [and ]mockups[, and laboratory 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 Designer and Commissioning Authority, 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.

## 1.8 QUALITY CONTROL

**[Coordinate items in this section with Designer during Design Phase. Delete unnecessary requirements as determined by Division 02 through 33.]**

- 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 the types of testing and inspecting they are engaged to perform.
  2. Payment for these services will be made from testing and inspecting 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 required to verify that the Work complies with requirements, whether specified or not.
  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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

- a. Contractor shall not employ the 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 inspecting 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 inspecting 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 quality assurance and control services required due to changes in the Work proposed by or made by the Contractor.
  8. Provide quality control services for Work done contrary to the Contract Documents, without prior notice, when so specified, or without proper supervision.
  9. Overtime expenses and schedule delays accruing as a result of executing quality control services shall be the Contractor's responsibility and shall not be charged to the Owner.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. **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.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents. Designer retains the right to require the use of a different testing agency for retesting and reinspecting.
- F. **Testing Agency Responsibilities:** Cooperate with Designer, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Designer, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
  7. Attend Project progress meetings as requested by Designer.

- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field-curing of test samples.
  5. Delivery of samples to testing agencies or arranging for pick-up of test samples after normal business hours.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- 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 inspecting.
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 schedule concurrently with Contractor's Construction Schedule as specified in Section 013200 "Construction Progress Documentation."
1. Distribution: Distribute schedule to Owner, Designer, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.9 SPECIAL TESTS AND INSPECTIONS

**[Coordinate items in this section with Designer during Design Phase. Delete unnecessary requirements as determined by Division 02 through 33.]**

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Designer, Commissioning Authority, 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 Designer and Commissioning Authority, with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Designer.
  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 Designer's, Commissioning Authority's, reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for Section 017300 "Execution."
  2. Protect construction exposed by or for quality-control service activities.
  3. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000



**SECTION 014200  
REFERENCES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements relating to referenced standards.

**1.02 QUALITY ASSURANCE**

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with the reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

**END OF SECTION**

## SECTION 014339 – MOCKUPS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for mockups of the following types:
  - 1. None.
- B. Related Requirements: Refer to applicable sections of the Specifications for materials, products and components to be included in mockups.

## 1.2 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.

## 1.3 DEFINITIONS

- A. Mockups: Full-size physical assemblies that are constructed on-site, unless indicated otherwise. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, 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.

## 1.4 QUALITY ASSURANCE

- A. Mockups, General: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish shown in the Drawings and specified in individual Sections, to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Designer.
  - 2. Notify Designer seven (7) calendar days in advance of dates and times when mockups will be constructed.
  - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction of the Work.
  - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 5. Obtain Designer's and NC State University Architect's Office approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 7. Demolish and remove mockups when directed, unless otherwise indicated.
- B. Preinstallation Conference: Conduct conference at Project site.

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1. Review requirements for construction of mockups, and for protecting and maintaining mockups.
2. Review procedures for reviewing, changing, and approval of mockups.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014339

## SECTION 015000 - TEMPORARY FACILITIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes requirements for support facilities, and security and protection facilities.
  - 1. Provide and maintain all temporary facilities and controls necessary for the performance of the Work. Locate and install all facilities and controls where acceptable to the local authorities having jurisdiction and utility owner and remove same and terminate, in a manner suitable to the utility owner, at completion of the Work or when otherwise directed. Pay all costs associated with the provision and maintenance of temporary facilities and controls including power, water, and fuel (if any) consumed until Substantial Completion.
  - 2. Notwithstanding these specifications for Temporary Facilities and Controls, the incorporation of all temporary facilities and controls into the Project shall be subject to the Owner's approval.
- B. Related Sections include the following:
  - 1. Section 013300 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 2. Section 015100 "Temporary Utilities" for requirements associated with temporary utilities.
  - 3. Section 015639 "Temporary Tree & Plant Protection" for requirements associated with protection of trees & plants.
  - 4. Section 015700 "Temporary Controls" for Pest Control requirements.
  - 5. Section 017300 "Execution" for progress cleaning requirements.
  - 6. Section 017419 "Construction Waste Management and Disposal" for waste management requirements.
  - 7. Section 017700 "Closeout Procedures" for closeout requirements.
  - 8. Divisions 02 through 49 for temporary heat, ventilation, and humidity requirements for products in those Sections.

## 1.2 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.

## 1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Designer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

## 1.4 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities are not chargeable to Owner or Designer and shall be included in the Contract Sum, unless otherwise indicated. Allow other entities to use temporary services and

facilities without cost, including, but not limited to, the following:

1. Owner's personnel.
2. Owner's construction forces.
3. Designers.
4. Commissioning Authority.
5. Testing agencies.
6. Personnel of authorities having jurisdiction.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Site Logistics Plan: Using the Site Plan from the Drawings as a base, prepare and maintain a detailed logistics plan showing, at a minimum: temporary facilities, fencing, signage, utility hookups, staging areas, and parking areas for construction personnel. Additional sheets, including markup on interior sheets, or sheets wholly prepared by the Contractor, may be required to reasonably convey the current logistics plan for the project.
  1. Submit initial Site Logistics Plan not less than five (5) working days prior to preconstruction conference.
  2. Update Site Logistics Plan as site conditions evolve during progress of the work, but not less than monthly.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
  1. Submit Fire Safety Program not less than five (5) working days prior to preconstruction conference.

#### 1.6 QUALITY ASSURANCE

- A. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, and ICC/ANSI A117.1.

#### 1.7 PROJECT CONDITIONS

- A. Conditions of Use: The following conditions apply to use of temporary facilities by all parties engaged in the Work:
  1. Keep temporary facilities clean and neat.
  2. Relocate temporary facilities as required by progress of the Work.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. General: Provide materials suitable for use intended.
- B. Pavement: Comply with paving Sections.
- C. Lumber and Plywood: Comply with requirements in Section 061053 "Miscellaneous Rough Carpentry."

- D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
- F. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- G. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- H. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- I. Water: Potable.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
  - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- B. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
  - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

## PART 3 - EXECUTION

### 3.1 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.
  - 1. Locate facilities to limit site disturbance as specified in Section 011400 "Work Restrictions."

- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 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.
  - 2. Maintain support facilities until Designer schedules Final Inspection. Remove before Final Acceptance. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- C. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- D. Temporary Elevator Use: As indicated in drawings.
- E. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

### 3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing 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.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects
  - 1. Comply with work restrictions specified in Section 011400 "Work Restrictions."
- C. Barricades, Warning Signs, and Lights: Comply with authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting. Paint with appropriate colors and graphics to inform personnel and public of possible hazard.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- E. 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 not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
  2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
  3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing construction.
  4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
  5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- F. Temporary Partitions: Provide and maintain floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction side of stud framing.
  2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
  3. Insulate partitions to control noise transmission to occupied areas.
  4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
  5. Protect air-handling equipment.
  6. Provide walk-off mats at each entrance through temporary partition.
- G. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, 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 area.
  2. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
    - a. Field Offices: Class A stored-pressure water-type extinguishers.
    - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
    - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
  3. Store combustible materials in containers in fire-safe locations.
  4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting.
  5. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
  6. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including



connected services, and place into operation and use. Instruct key personnel on use of facilities. Protect fire protection system from damage due to construction activities and environmental conditions.

7. Develop and supervise an overall fire-prevention and first-aid fire-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.
8. 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.

- H. **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 environmentally safe materials.
- I. **Termite Control:** By Owner. Contractor to provide ten (10) working days notice prior to the treatment being required.

### 3.4 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. Protect from damage caused by freezing temperatures and similar elements.
  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.
  2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. **Temporary Facility Changeover:** Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- 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 Substantial Completion. 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 the property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary paving not intended for or acceptable for integration into permanent paving. 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 authorities having

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- jurisdiction.
3. At Substantial Completion, repair, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 017700 "Closeout Procedures."

END OF SECTION 015000

## SECTION 015100 - TEMPORARY UTILITIES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes requirements for temporary utilities.
1. Provide and maintain all temporary utilities necessary for the performance of the Work. Locate and install all utilities where acceptable to the local authorities having jurisdiction and utility owner and remove same and terminate, in a manner suitable to the utility owner, at completion of the Work or when otherwise directed. Pay all costs associated with the provision and maintenance of temporary facilities and controls including power, water, and fuel (if any) consumed until Substantial Completion.
  2. Notwithstanding these specifications for Temporary Utilities, the incorporation of all temporary utilities into the Project shall be subject to the Owner's approval.
- B. Related Sections include the following:
1. Section 013300 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  2. Section 015000 "Temporary Facilities and Controls" for requirements associated with temporary facilities.
  3. Section 017300 "Execution" for progress cleaning requirements.
  4. Section 017419 "Construction Waste Management and Disposal" for waste management requirements.
  5. Section 017700 "Closeout Procedures" for closeout requirements.
  6. Section 313116 "Termite Control" for pest control.
  7. Divisions 02 through 49 for temporary heat, ventilation, and humidity requirements for products in those Sections.

## 1.2 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.

## 1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities are not chargeable to Owner or Designer and shall be included in the Contract Sum, unless otherwise indicated. Allow other entities to use temporary services without cost, including, but not limited to, the following:
1. Owner's personnel.
  2. Owner's construction forces.
  3. Designers.
  4. Commissioning Authority.
  5. Testing agencies.
  6. Personnel of authorities having jurisdiction.
- B. Sewer Service: No sewer service use charge by Contractor, paid for by Owner. Contractor responsible for hookup and disconnect.

- C. Water Service: No water service use charge by Contractor, paid for by Owner. Contractor responsible for hookup and disconnect.
- D. Electric Power Service: No electric power service use charge by Contractor, paid for by Owner. Contractor responsible for hookup and disconnect.
- E. Internet Service: Owner does not allow Contractor to connect to university internet service. Contractor is responsible for providing internet service in all temporary facilities.

1.4 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
  - 1. 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 authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
  - 1. Temporary Use of Permanent Utilities: Installer of each permanent service shall 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.
- B. Conditions of Use: The following conditions apply to use of temporary services by all parties engaged in the Work:
  - 1. Keep temporary services clean and neat.
  - 2. Relocate temporary services as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials suitable for use intended.

2.2 EQUIPMENT

- A. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- B. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits

may be nonmetallic sheathed cable.

- C. Temporary 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 Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- D. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction after dust generating activities in areas serviced by the system are complete, 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 017700 "Closeout Procedures."
1. Warranty period for the HVAC system begins at Final Acceptance, not the date in which the unit was started up.
  2. Contractor is responsible for a full duct cleaning of systems that serve the work area and filter changes prior to Final Acceptance.

### PART 3 - EXECUTION

#### 3.1 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
  2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
- B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
  2. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
  3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
  4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures

adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water for use of construction personnel. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
  2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
    - a. Drinking-Water Facilities: Provide bottled-water or drinking-water units. Ensure dispensed water temperature is between 45 to 55 deg F.
- E. 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 from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install electric power service underground, unless overhead service must be used.
  2. Install power distribution wiring overhead and rise vertically where least exposed to damage.
- H. 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.

## SECTION 015500 – VEHICULAR ACCESS &amp; PARKING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes requirements for vehicular access and parking.
- B. Related Sections include the following:
  - 1. Section 015000 "Temporary Facilities" for requirements associated with temporary facilities.

## 1.2 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.

## PART 2 – PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- B. Parking: Contractor and all tiered subcontractors can park in surface lot and parking deck indicated on plans provided each vehicle has a Contractor parking pass. Parking passes can be purchased online through NC State Transportation.

END OF SECTION 015500

## SECTION 015639 - TEMPORARY TREE &amp; PLANT PROTECTION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes requirements for tree & plant protection during the Project.
- B. Related Sections include the following:
  - 1. Section 015100 "Temporary Facilities" for requirements associated with temporary utilities.

## 1.2 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.

## PART 2 – PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 PROTECTION OF EXISTING TREES &amp; PLANTS

- A. 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. All pruning of existing plant materials, including roots and limbs, for construction clearances shall be done by a trained, licensed, insured arborist and according to standards set forth in the National Arborist Association publication "Standards for the Pruning for Shade Trees". All pruning shall be coordinated with and inspected by NC State Grounds Management.
  - 2. If additional pruning beyond what was described in the Project Documents is required as site logistics evolve, coordinate additional pruning with NC State Grounds Management.

## 3.2 TREE &amp; PLANT PROTECTION

- A. 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.
  - 1. A permit, issued by NC State Grounds Management, is required for vehicular access to brick and landscape areas. For single loads up to 9000 lbs., a  $\frac{3}{4}$ " minimum plywood base shall be placed over brick paving, root zones of trees, and lawn areas to be protected from vehicular work traffic at a construction site. For single loads over 9000 lbs., two layers of  $\frac{3}{4}$ " plywood is required. Root zones and lawn areas shall not be covered with plywood for more than 3 consecutive days.
  - 2. For projects of duration longer than 3 days or requiring multiple heavy loads into a construction landscape protection zone, a construction entry road shall be included in the contract documents to indicate access route for heavy



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loads into the site. This construction entry shall consist of 10' x 16' oak logging mats on 6" coarse, chipped, hardwood placed on a permeable structural, filter fabric, top-dressed with an additional 10" of hardwood mulch. Mulch and logging mats shall be supplemented throughout the project to keep the access area structurally functional. At the end of the project the logging mats shall be offered to Facilities Operations for salvage or disposed of offsite at the discretion of the Owner.

END OF SECTION 015639

## SECTION 015700 - TEMPORARY CONTROLS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes requirements for support facilities, and security and protection facilities.
  - 1. Provide and maintain all temporary facilities and controls necessary for the performance of the Work. Locate and install all facilities and controls where acceptable to the local authorities having jurisdiction and utility owner and remove same and terminate, in a manner suitable to the utility owner, at completion of the Work or when otherwise directed. Pay all costs associated with the provision and maintenance of temporary facilities and controls including power, water, and fuel (if any) consumed until Substantial Completion.
  - 2. Notwithstanding these specifications for Temporary Facilities and Controls, the incorporation of all temporary facilities and controls into the Project shall be subject to the Owner's approval.
- B. Related Sections include the following:
  - 1. Section 013300 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 2. Section 015100 "Temporary Utilities" for requirements associated with temporary utilities.

## 1.2 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.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Moisture-Protection Plan: Not less than five (5) working days prior to preconstruction conference, Contractor shall submit a Moisture Protection plan Describing procedures and controls for protecting materials and construction from water absorption and damage.
  - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, bathroom waterproofing testing, 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.
- B. Dust- and HVAC-Control Plan: Not less than five (5) working days prior to preconstruction conference, 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. Identify further options if proposed measures are later determined to be inadequate. 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.
- C. Noise & Vibration Control Plan: Not less than five (5) working days prior to preconstruction conference, submit a Noise & Vibration Control Plan describing procedures and controls for protecting adjacent classrooms, laboratories, dormitories, common areas, and food service areas from excess noise and vibration. Pay special attention to exam and graduation periods. Include a description of how the Contractor will mitigate the following:
1. Vibration resulting from site preparation activities that could impact active experiments or student learning.
  2. Noise resulting from shooting hangers, drywall tracks, or other components into floor below active classrooms.
  3. Saw cutting and grinding activities.
  4. Equipment noise.

## PART 2 – PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: 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 Phase: 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, replace, or clean stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: 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 permanent HVAC system to control humidity.
  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.
    - 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 Designer.
    - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

END OF SECTION 015700

## SECTION 015800 – PROJECT IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes requirements for project identification.
- B. Related Sections include the following:
  - 1. Section 015000 "Temporary Facilities" for requirements associated with temporary utilities.

#### 1.2 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.

### PART 2 – PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 PROJECT SIGNS

- A. Project Signs: Project signs are not allowed. Directional signs for material deliveries are allowed within the construction area, if required, and shall be 4' wide x 2' high maximum, black and white only. The NCSU Project Manager shall approve the design of the sign and the sign text.

END OF SECTION 015800

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**SECTION 016116  
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for VOC-Content-Restricted products.

**1.02 DEFINITIONS**

- A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
  - 1. Interior paints and coatings applied on site.
  - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
  - 3. Wet-applied roofing and waterproofing.
  - 4. Other products when specifically stated in the specifications.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

**1.04 QUALITY ASSURANCE**

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
  - 1. Evidence of Compliance: Acceptable types of evidence are:
    - a. Report of laboratory testing performed in accordance with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
  - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
  - 2. Joint Sealants: SCAQMD 1168 Rule.
  - 3. Paints and Coatings: Each color; most stringent of the following:
    - a. 40 CFR 59, Subpart D.
    - b. SCAQMD 1113 Rule.
    - c. CARB (SCM).
  - 4. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

**PART 3 EXECUTION**

**3.01 FIELD QUALITY CONTROL**

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

**END OF SECTION**

## SECTION 017300 - EXECUTION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Installation of the Work.
  - 2. Cutting and patching.
  - 3. Coordination of Owner-installed products.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  
- B. Related Sections include the following:
  - 1. Section 013100 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. Section 013300 "Submittal Procedures" for submitting surveys.
  - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

## 1.2 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.

## 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
  
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

## 1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Designer of locations and details of cutting and await directions from Designer 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.

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. Sprayed fire-resistive material.
    - d. Equipment supports.
    - e. Piping, ductwork, vessels, and equipment.
    - f. 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 Designer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Designer for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. 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.
- B. 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.
- C. 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 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 interpretation to Designer according to Section 012613 "Request for Interpretation."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
3. Make vertical work plumb and make horizontal work level.
  4. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  5. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated. Where indicated to remain exposed, arrange overhead systems in an orderly manner.
  6. 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: Do not use tools or equipment that produces harmful noise levels.
  - G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
  - H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions
    - 3. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Designer.
    - 4. Allow for building movement, including thermal expansion and contraction.
    - 5. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
  - I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
  - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
  - K. Protect adjacent property and adjoining work, including sealant bond surfaces, from spillage or blow-over of coatings, paints, sprayed fire-resistive material, and other spray-applied products. Cover adjoining and nearby surfaces, including live plants and grass, if there is possibility of spray-applied products being deposited on surfaces.
- 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.
    - 3. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
  - B. Temporary Support: Provide temporary support of work to be cut.
  - C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
  - D. 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.
    - 3. 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.
4. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  5. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill. Avoid cutting steel reinforcement.
    - a. Locate steel reinforcement using Ground Penetrating Radar or Ferroskan prior to cutting or drilling reinforced concrete and masonry. If existing steel reinforcement is in proposed cut or hole location, contact Designer before proceeding with the Work.
  6. 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.
  7. Proceed with patching after construction operations requiring cutting are complete.
- E. 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.
3. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  4. 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.
  5. 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.
  6. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  7. Ceramic Tile: Provide ceramic tile and grout to match existing. Remove and replace tile damaged as a result of Work of this Contract. Comply with TCNA's "Handbook for Ceramic Tile Installation" for installation method to match existing. Lay tile in grid pattern to match existing. Make joints between existing and new tile same width so patches are not apparent in finished work.
- F. 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 forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
  - 3. 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.
  - 4. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces 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. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 3. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 4. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
  - 5. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- 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.
  - 3. Remove liquid spills promptly.
  - 4. 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: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted. Comply with Section 017419 "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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 014000 "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 Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging, Recycling, and Disposal of nonhazardous demolition and construction waste.
  - 2. Handling and disposing of hazardous demolition and construction waste.
- B. Related Sections include the following:
  - 1. Section 006000 "Project Forms" for the Designer Waste Information Form for the project and Non-Hazardous Waste Tracking Forms.

## 1.2 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 and waste materials (i.e. brick, concrete, asphalt, and aggregate).
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Special Waste: Solid wastes that require special handling and management.
- D. Hazardous Waste: Any solid waste that is ignitable, corrosive, reactive, or toxic; a listed hazardous material or containing a listed hazardous material per Title 40 Code of Federal Regulations Parts 260-270.
- E. Universal Waste: Hazardous wastes that have been provided specific exemptions (40 CFR 273) to encourage recycling. Universal wastes are limited to recalled or cancelled pesticides and intact batteries, lamps, and mercury containing devices. State regulations prohibit the crushing of fluorescent lamps.
- F. 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.
- G. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- H. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- I. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.3 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice

to Proceed.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For waste management coordinator.

1.5 CLOSEOUT SUBMITTALS

- A. Hazardous Waste Disposal Certificates: Contractor shall provide NC State with a copy of all hazardous, universal, and special waste disposal certifications and/or manifest for all waste shipped.
- B. Construction & Demolition Waste and Recycling Tracking Forms: All reuse, recycling, and landfilled materials are to be tracked and compiled on NC State's "Construction & Demolition Waste & Recycling Tracking Form", which is included in Section 006000 "Project Forms".
- C. Construction & Demolition Salvaged Material Form: All salvaged materials are to be tracked and compiled on NC State's "Construction & Demolition Salvaged Material Form" which is included in Section 006000 "Project Forms".

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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.

1.7 WASTE MANAGEMENT PLAN

- A. General: The plan shall include details on how the hazardous and non-hazardous generated waste will be managed in accordance with local, state, and federal regulations. Contractor must also provide all materials, personnel, and protective equipment necessary to remove and store wastes in accordance with the plan. The Contractor must coordinate salvage or reuse efforts identified on the Designer Waste Information Form with NC State and/or the non-profit entity.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator.



1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
- D. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- 1.8 PERFORMANCE GOALS & REQUIREMENTS
- A. All hazardous and non-hazardous generated waste shall be managed in accordance with local, state, and federal regulations.
  - B. Seventy-five percent (75%) of a project's non-hazardous waste must be diverted from landfill disposal through reuse and recycling.
  - C. One hundred percent (100%) of yard waste must be diverted from landfill disposal through reuse and recycling.
  - D. The Designer must complete the Designer Waste Information Form (<http://go.ncsu.edu/wasteinfoform>) and identify regulated wastes, as well as materials, fixtures, and equipment that are to be salvaged for reuse or recycled. The location of the staging area as well as the responsible party for removal, delivery, and/or pick up must also be included.
    1. The completed Designer Waste Information Form has been included in Section 006000 "Project Forms".
- 1.9 MANAGEMENT OF HAZARDOUS, UNIVERSAL, AND SPECIAL WASTES
- A. Hazardous, universal, and special wastes must be managed separately from other C&D wastes.
  - B. Disposal must be coordinated with NC State Environmental Health & Safety.
  - C. Special wastes include:
    1. Paints, varnish, solvents, sealers, thinners, resins, roofing cement, adhesives, lubricants, and caulk, or drums and containers that once held these materials.
    2. Treated wood including lumber, posts, ties, decks, and utility poles (creosote, arsenic, chromium, pentachlorophenol).
    3. Asbestos, PCBs, mercury, or lead containing materials
    4. Used oil
    5. Lead acid batteries
    6. Medical wastes
  - D. Waste disposal responsibility falls to one of two parties: the Contractor or NC State, as defined in the NC State Environmental Health and Safety's document: Management of Building Demolition Debris available at: <http://go.ncsu.edu/demodebris>
    1. Containers used for waste storage must be United States Department of

Transportation approved. The Contractor must supply bins, tanks or tank trucks. Containers must remain closed at all times except when material is being added. NC State will provide containers for items collected by NC State.

2. Hazardous waste containers must have labels that clearly identify waste streams. Different waste streams cannot be combined in a shared container. The Contractor must identify the initial accumulation date on the hazardous waste label when waste is first placed in the container.
3. Waste containers must be stored in a secured, covered, and well identified area of the construction site. Hazardous waste cannot be stored for more than 90 days. Any waste stored for more than six days must be inspected, and the inspection documented, weekly.
4. Spill response supplies must be on-site and adequate to contain 110% of any accumulated waste. Portable fire extinguishers must also be readily available. If a spill occurs, Contractor must contact NC State immediately and proceed with spill containment and clean up.
5. The Contractor must provide NC State with a copy of all hazardous, universal, and special waste disposal certifications and/or manifests for all waste shipped.

#### 1.10 MANAGEMENT OF NON-HAZARDOUS WASTE

##### A. Priority 1 - Salvage of Construction and Demolition Waste for Reuse

1. Salvaged materials should first be evaluated for use in University construction projects. NC State Surplus Property Services should be considered if there are reusable materials that have resale value and are no longer needed by the University. Contact Waste Reduction and Recycling ([recycle@ncsu.edu](mailto:recycle@ncsu.edu)) for assistance with disposition. Examples of Salvageable material include:
  - a) Furniture and electronics
  - b) Cabinets and shelves that are not built-in
  - c) Sinks and water fountains
  - d) Paper towel dispensers
  - e) Newer light fixtures
  - f) Dry erase boards, chalkboards, and cork boards
  - g) Solid wood panel doors
  - h) Brick pavers
2. Contact vendors about take-back programs to recycle materials their company provides. These materials include, but are not limited to ceiling tiles, carpet tiles, and cubicle walls.
3. Coordinate with the Project Manager to utilize the NC State Construction Shop for the careful removal of salvageable items prior to contractor demolition. An estimate for the Construction Shop's work must be received during design and must be initiated prior to the project going out to bid.

##### B. Priority 2 - Recycling of Construction and Demolition Waste

1. If materials are not a salvageable for reuse, they must be source separated to the greatest extent possible and recycled.
2. Common source separated materials for recycling include:
  - a) Cardboard
  - b) Bottles and cans
  - c) Scrap metal and wire
  - d) Rigid plastics

- e) Untreated/unpainted dimensional lumber
- f) Gypsum board (unpainted)
- g) Concrete
- h) Asphalt (pavement and shingles)
- i) Aggregate
- j) Brick and CMU
- k) Carpet and Pad

3. 100% of the following materials must be recycled:

- a) Paper
- b) Cardboard
- c) Bottles and cans
- d) Scrap metal and wire
- e) Concrete
- f) Asphalt (pavement and shingles)
- g) Aggregate
- h) Brick and CMU
- i) Plastic sheet and film
- j) Polystyrene packaging
- k) Wood crates
- l) wood pallets
- m) plastic pails

C. Priority 3 - Disposal of Construction and Demolition Waste

- 1. If material/s cannot be salvaged for reuse or source separated and recycled, they must be sent to a C&D recycling and reclamation facility. Materials are not to be sent directly to a landfill or a facility that does not sort and recycle.
- 2. Regardless of salvage/recycle goal indicated in "General" paragraph above, salvage or recycle 100% of the following construction office waste materials:

- a) Paper
- b) Aluminum cans
- c) glass containers

D. All solid waste management facilities must be permitted to operate by NCDEQ in accordance with 15A NCAC 13B .0201.

1.11 DUMPSTER SERVICES

- A. Contractor is responsible for providing the dumpster for the project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. 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 operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  - 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.
  
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 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 according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
  - 2. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 5. Store components off the ground and protect from the weather.
  - 6. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.3 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.

- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- 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. 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.
- G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- H. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- J. 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.
- K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- L. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.4 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. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
- 3.5 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: Remove waste materials from Owner's property and legally dispose of them.

PART 4 - END OF SECTION 017419

## SECTION 017700 - CLOSEOUT

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 006000 "Project Forms" for Completion Checklists and Project Acceptance forms.
  - 2. Section 012900 "Payment Procedures" for Payment at Final Acceptance .
  - 3. Section 013100 "Project Management & Coordination" for information regarding the Project Website used for the Punch List(s).
  - 4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 6. Section 017846 "Maintenance Materials" for submitting maintenance materials requirements.
  - 7. Section 017900 "Demonstration & Training" for completing training and submitting documentation of completed training.

## 1.2 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.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents used during Final Clean.
- B. Contractor's Pre-Final Punch List: Submitted no later than thirty (30) calendar days prior to Final Acceptance.
- C. Final Inspection Punch List: Submitted at Final Acceptance. All work must be complete within thirty (30) calendar days of the Final Inspection.

## 1.4 CLOSEOUT SUBMITTALS

- A. As listed in the checklists referenced in Paragraph 1.5 of this Section, and as itemized in the various Specification Sections of this Project Manual.
- B. Closeout Submittal Log: Contractor shall, at 50% complete, as determined by the project schedule, submit to Designer a log of schedule of all Closeout Submittals required by the Project Documents.

## 1.5 FINAL ACCEPTANCE PROCEDURES

- A. The checklists and timelines listed herein are organized in a manner to prepare the Project Team for SCO's Inspection for Beneficial Occupancy (if applicable) and SCO's Final Inspection for Final Acceptance. The checklists provided herein are required to be

completed in the timelines provided herein in their entirety, but the checklists do not replace the SCO Forms for Beneficial Occupancy and Final Acceptance, both of which are included in Section 006000 "Project Forms" and will be uploaded by the Designer to Interscope after the milestone is achieved.

- B. Request for Designers Pre-Final Inspection: No less than ten (10) working days prior to Designer's Pre-Final Inspection, Contractor shall submit to Designer, in an organized .zip folder, the items shown on the Request for Designers Pre-Final Inspection Checklist, as included in Section 006000 "Project Forms".
- C. Request for Final Inspection: No less than ten (10) working days prior to the SCO Final Inspection, Contractor shall submit to Designer, in an organized .zip folder, the items shown on the Request for Final Inspection Checklist, as included in Section 006000 "Project Forms".
  - 1. If the project has a phase that requires Beneficial Occupancy, as noted in Article 23 of the Supplemental General Conditions, use the Request for Final Inspection Checklist to prepare for Beneficial Occupancy.
- D. Final Inspection: To achieve Final Acceptance, all items on the Final Acceptance Checklist must be complete. Contractor shall submit to Designer, in an organized .zip folder, all items shown on the Final Acceptance Checklist. Once all items on the Final Acceptance Checklist are complete, the Project has achieved Final Acceptance.
- E. Project Closeout: Prior to Final Payment, Contractor must submit all items on the Project Closeout Checklist as included in Section 006000 "Project Forms".

#### 1.6 LIST OF INCOMPLETE ITEMS (CONTRACTORS COMPLETION / DESIGNER PUNCH LIST)

- A. Preparation: 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, proceeding from lowest floor to highest floor.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. NC State Project Name and location.
    - b. NC State Project Number, Code & Item, and State Construction Office Project Number.
    - c. Date.
    - d. Name of Designer.
    - e. Name of Contractor.
    - f. Page number.
- B. Submit list of incomplete items in electronic tracking system format. Designer will utilize agreed upon electronic tracking system (Project Website). Access shall be provided by the contractor.
  - 1. Required Functions of Electronic Tracking System:



- a. Ability to download and sync tasks with Apple iPad over non-persistent wireless internet connection.
  - b. Drawing markup and viewing, for location identification of incomplete items.
  - c. Authorship tracking of each comment and subsequent action, including timestamps.
  - d. Sortable, filterable, itemized listing of incomplete items, by at a minimum unique issue number, date, location, issue author and responsible party.
  - e. Ability to append photos and markups on photos for the purpose of identifying incomplete items and demonstrating completeness of items.
  - f. Ability to incorporate Designer's provided list of pre-generated comments.
- C. Designer will direct all incomplete items to the attention of the Contractor, who shall identify responsible subcontractors.
- D. Contractor shall verify all items for completion prior to forwarding to Designer for action. To the maximum extent feasible, items shall be documented for closeout with clear photographs in the software, taken with context to identify the specific issue is resolved.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Provide Project Record Documents as specified in Section 017839 "Project Record Documentation".

#### 1.8 OPERATION AND MAINTENANCE MANUALS

- A. Assemble and provide complete set of operation and maintenance data as specified in Section 017823 "Operation & Maintenance Data".

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Submit written warranties as specified in Section 017823 "Operation & Maintenance Data".

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the 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: Provide 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 Designers Pre-Final Inspection:
  - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
  - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - c. Rake grounds that are 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 hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited access spaces, including plenums, shafts, and similar spaces.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces. Remove labels that are not meant to be permanent.
  - k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - n. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in lighting fixtures to comply with requirements for new fixtures.
  - p. Leave Project clean and ready for occupancy.
  
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
  
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for

determination of Substantial Completion.

- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
    - b. Do not paint over labels for fire resistive joints.
  3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

## SECTION 017823 – OPERATION &amp; MAINTENANCE DATA

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout.

## 1.2 RELATED DOCUMENTS

- A. Section 006000 "Project Forms" for forms preparing for Final Acceptance.
- B. Section 013300 "Submittal Procedures" for requirements associated with the submission and approval of Submittals.
- C. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

## 1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance manual(s) as required by the Project Documents.

## 1.4 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

- 1. Operation Data:

- a. Emergency instructions and procedures.
- b. System, subsystem, and equipment descriptions, including operating standards.
- c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
- d. Description of controls and sequence of operations.
- e. Piping diagrams.
- f. Noise and vibration adjustments.
- g. Effective energy utilization.

- 2. Maintenance Data:

- a. Manufacturer's information, including list of spare parts.
- b. Name, address, and telephone number of Installer or supplier.
- c. Maintenance procedures.
- d. Maintenance and service schedules for preventive and routine maintenance.
- e. Maintenance record forms.
- f. Sources of spare parts and maintenance materials.
- g. Copies of maintenance service agreements.
- h. Copies of warranties and bonds.
- i. Cleaning.
- j. Control sequence.

- k. Fuels, lubricants, tool, and other related items.
    - l. Identification systems.
- B. Organize approved Operation and Maintenance manuals by Division in a bookmarked .pdf electronic file to submit to Owner.
- C. Print one set of hard copies of the Operation and Maintenance Manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017823

## SECTION 017839 – PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for submitting record Drawings, record Specifications, and record Product Data.

## 1.2 RELATED DOCUMENTS

- A. Section 017700 "Closeout" for administrative and procedural requirements for contract closeout.

## 1.3 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Designer's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of electronic Portable Document Format (.pdf) prints of Contract Drawings and Shop Drawings.

- 1. Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up record prints.

- a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later, and the locations of those items that need to be located for servicing.
- b. Accurately record information in a readily understandable drawing technique.
- c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
- d. Mark record prints completely and accurately.
- e. Mark important additional information that was either shown schematically or omitted from original Drawings.
- f. Note Change Order numbers, alternate numbers, and similar identification where applicable.

- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Clearly mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

- a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
- c. Note related Change Orders, Record Drawings, and Product Data, where applicable.

- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
- a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - b. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - c. Note related Change Orders, Record Drawings, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections such as tests and inspections, and inspections by authorities having jurisdiction. Electronically bind in Portable Document Format (.pdf) and bookmark miscellaneous records and identify each, ready for continued use and reference.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

## SECTION 017846 – MAINTENANCE MATERIALS AND ATTIC STOCK

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for maintenance materials (commonly referred to as “attic stock”).

## 1.2 RELATED DOCUMENTS

- A. Section 017700 “Closeout” for closeout requirements.
- B. Section 017823 “Operation and Maintenance Data” for operation and maintenance manual requirements.
- C. Section 017839 “Project Record Documents” for submitting record Drawings, record Specifications, and record Product Data.

## 1.3 CLOSEOUT SUBMITTALS

- A. Schedule of Maintenance Material and Attic Stock Items: For maintenance material submittal items listed below and as specified in other Sections. Contractor shall submit the following a minimum of 5 days prior to requesting an inspection for determining date of Final Acceptance for the Work or a designated portion thereof.
  - 1. Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Label with manufacturer's name and model number where applicable. Obtain Designer's signature for receipt of submittal.
- B. Maintenance Material and Attic Stock Transmittal: Prior to Final Acceptance, Contractor shall turn over all items on the Schedule of Maintenance Material Items to N.C. State. Contractor shall obtain N.C. State's recipients signature for each item received by each recipient.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Division 09 Finishes
  - 1. 09 51 00 Acoustical Ceilings - Extra Acoustical Units: Quantity equal to 5 percent of total installed.
  - 2. 09 65 00 Resilient Flooring - Extra Flooring Material: 5 percent of each type and color. Extra Wall Base: 10 linear feet of each type and color.
  - 3. 09 68 13 Tile Carpeting - Extra Flooring Material: 5 percent of each type and color.
  - 4. 09 84 30 Sound Absorbing Panels - Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.
  - 5. 09 91 23 Interior Painting - Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
  - 6. 09 96 00 High Performance Coating - Extra Coating Materials: 1 gallon of each type and color.



- B. Division 21 Fire Protection (if applicable)
  - 1. Required number of spare sprinkler heads in accordance with NFPA 13 and installed replacement head cabinets.
  - 2. Sprinkler wrenches provide two (2) per type of sprinkler installed.
  - 3. Concealed sprinkler cover plates equal to number installed.
  
- C. Division 23 Campus Automation (if applicable)
  - 1. Sensors provide one (1) of each type (hydronic, air supply and humidity)
  - 2. Zone thermostats provide two (2).
  - 3. Filters for the compressed air system provide two (2) sets.
  
- D. Division 26 Fire Alarm systems (if applicable)
  - 1. Fuses provide two (2) of each size installed.
  - 2. MPS with monitor modules provide a minimum of one (1) or 2% of total installed.
  - 3. Audio-visual devices provide a minimum of one (1) or 4% of total installed.
  - 4. Indoor strobe only devices, provide a minimum of one (1) or 4% of total installed.
  - 5. Exterior indicating devices, provide a minimum of one (1) or 2% of total installed.
  - 6. Spot Smoke Detectors provide a minimum of one (1) or 6% of total installed.
  - 7. Spot heat/thermal detectors provide a minimum of one (1) or 6% of total installed.
  - 8. Spot detector bases provide a minimum of one (1) or 2% of total installed.
  - 9. Spot detector sounder bases provide a minimum of one (1) or 6% of total installed.
  - 10. Relay modules provide a minimum of one (1) or 4% of total installed.
  - 11. Monitor modules provide a minimum of one (1) or 4% of total installed.
  
- E. Refer to specification sections for additional requirements.

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION 017846

## SECTION 017900 – DEMONSTRATION &amp; TRAINING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
  - 2. Demonstration and training video recordings.

## 1.2 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.
- B. The following sections provide additional demonstration and training requirements:
  - 1. 11 5313 – Laboratory Fume Hoods

## 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. Indicated 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. Qualification Data: For facilitator.

## 1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) working days of the 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 Designer.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Date of video recording.
  - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. 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 paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

- 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.

#### 1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A competent videographer who is experienced photographing demonstration and training events similar to those required. If Contractor is to have their personnel perform the videography, Contractor must send a sample of audio and video quality to Owner and Designer for approval prior to the training being scheduled. Sample audio and video must be representative of the camera and microphone that will be used during the training.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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 have been reviewed and approved by Designer.

## 1.7 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. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. 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.

## 1.8 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 Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

## 1.9 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.
  - 1. Designer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- 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 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 give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

#### 1.10 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 recording quality of UHD 4k at 30 fps with vibration reduction technology. Use an external directional microphone (Rode VideoMic GO, or equivalent) to capture audio.
  - 1. Submit video recordings on 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017900

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**SECTION 024100  
DEMOLITION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Selective demolition of building elements for alteration purposes.
- B. Abandonment and removal of existing utilities and utility structures.

**1.02 DEFINITIONS**

- A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Pre-Demolition Photos: Submit to Owner and Architect for record.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
  - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
  - 2. Demolition firm qualifications.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

**PART 3 EXECUTION**

**2.01 DEMOLITION**

- A. Remove other items indicated, for salvage, relocation, and recycling.

**2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with requirements in Section 017000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Use of explosives is not permitted.
  - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 4. Provide, erect, and maintain temporary barriers and security devices.
  - 5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.



7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
  8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
  9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
- H. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
  2. Dismantle existing construction and separate materials.
  3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

### **2.03 EXISTING UTILITIES**

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

### **2.04 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.

2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction \_\_\_\_\_ .
  2. Provide sound retardant partitions of construction and in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
  2. Remove items indicated on drawings.
- E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
  2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  3. See Section 011000 - Summary for limitations on outages and required notifications.
  4. Verify that abandoned services serve only abandoned facilities before removal.
  5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
  2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
  4. Repair fire rated walls to maintain existing ratings.
  5. Patch to match new work.

#### **2.05 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Remove materials not to be reused on site; comply with requirements of Section 017419 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

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**SECTION 055000  
METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.Ceiling Service Panels.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
    - a. Include the following, as applicable:
      - 1) Design criteria.
      - 2) Engineering analysis depicting stresses and deflections.
      - 3) Member sizes and gauges.
      - 4) Details of connections.
      - 5) Support reactions.
      - 6) Bracing requirements.

**PART 2 PRODUCTS**

**2.01 MATERIALS - STEEL**

- A. Slotted Channel Fittings: ASTM A1011/A1011M.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

**2.02 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**2.03 FABRICATED ITEMS**

- A. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.
  - 1. Size: As indicated in drawings

**2.04 FINISHES - STEEL**

- A. Prime paint steel items.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.

- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

#### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

#### **3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

**SECTION 079200  
JOINT SEALANTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. Owner-provided field quality control.

**1.02 RELATED REQUIREMENTS**

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Backing material recommended by sealant manufacturer.
  - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 5. Substrates the product should not be used on.
  - 6. Substrates for which use of primer is required.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Installation Plan: Submit at least four weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- I. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- J. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- K. Installation Log: Submit filled-out log for each length or instance of sealant installed.
- L. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- M. Executed warranty.

#### 1.04 QUALITY ASSURANCE

- A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
  - 1. Adhesion Testing: In accordance with ASTM C794.
  - 2. Compatibility Testing: In accordance with ASTM C1087.
  - 3. Allow sufficient time for testing to avoid delaying the work.
  - 4. Deliver sufficient samples to manufacturer for testing.
  - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- B. Installation Plan: Include schedule of sealed joints, including the following:
  - 1. Joint width indicated in Contract Documents.
  - 2. Installation Log Form: Include the following data fields, with known information filled out.
    - a. Date of installation.
    - b. Name of installer.
    - c. Actual joint width; provide space to indicate maximum and minimum width.
    - d. Actual joint depth to face of backing material at centerline of joint.
    - e. Air temperature.
- C. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
  - 1. Identification of testing agency.
  - 2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
    - a. Test date.
    - b. Copy of test method documents.
    - c. Age of sealant upon date of testing.
    - d. Test results, modeled after the sample form in the test method document.
    - e. Indicate use of photographic record of test.
- D. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
  - 1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.
- E. Field Quality Control Plan:
  - 1. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- F. Field Adhesion Test Procedures:
  - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
  - 2. Have a copy of the test method document available during tests.
  - 3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
  - 4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
  - 5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.

6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
  1. Sample: At least 18 inches long.
  2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
  3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

### 1.05 WARRANTY

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Final Acceptance.

## PART 2 PRODUCTS

### 2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
  1. Exterior Joints:
    - a. Do not seal exterior joints unless indicated on drawings as sealed.
    - b. Seal the following joints:
      - 1) Wall expansion and control joints.
      - 2) Joints between doors, windows, and other frames or adjacent construction.
      - 3) Joints between different exposed materials.
  2. Interior Joints:
    - a. Do not seal interior joints indicated on drawings as not sealed.
    - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
    - c. Seal open joints except specific open joints indicated on drawings as not sealed.
  3. Do Not Seal:
    - a. Intentional weep holes in masonry.
    - b. Joints indicated to be covered with expansion joint cover assemblies.
    - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
    - d. Joints where sealant installation is specified in other sections.
    - e. Joints between suspended ceilings and walls.
- B. Type JS-1 - Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
  1. Type JS-2 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
  2. Type JS-3 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.
- C. Type JS-10 - Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
  1. Type JS-11 - Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.

2. Type JS-14 - Floor Joints in Wet Areas: Self-leveling polyurethane traffic-grade sealant suitable for continuous liquid immersion.
  3. Type JS-12 - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
  4. Type JS-11 - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
  5. Type JS-13 - Narrow Control Joints in Interior Concrete Slabs: Self-leveling polyurethane sealant.
- D. Interior Wet Areas: Restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

## 2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.
- B. Colors: As indicated on drawings.

## 2.03 NONSAG JOINT SEALANTS

- A. Type JS-1 - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
  1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
  2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
  3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
  4. Color: To be selected by Architect from manufacturer's custom range.
  5. Products:
    - a. Dow; DOWSIL 790 Silicone Building Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).
    - b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - c. Sika Corporation; Sikasil WS-290: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
    - d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- B. Type JS-12 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
  1. Color: White.
  2. Products:
    - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - b. Momentive Performance Materials, Inc/GE Silicones; SCS1700 Sanitary Silicone Sealant and Adhesive: [www.siliconeforbuilding.com/#sle](http://www.siliconeforbuilding.com/#sle).
    - c. Sika Corporation; Sikasil GP: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
- C. Type JS-10 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  1. Movement Capability: Plus and minus 25 percent, minimum.
  2. Color: To be selected by Architect from manufacturer's full range.
  3. Products:
    - a. Pecora Corporation; DynaTrol II: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - b. Sika Corporation; Sikaflex-1a: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).



- c. Tremco Commercial Sealants & Waterproofing; Dymonic 100:  
[www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- D. Type JS-11 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
  - 1. Color: To be selected by Architect from manufacturer's full range.
  - 2. Products:
    - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
    - b. Pecora Corporation; AC-20 +Silicone: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - c. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant:  
[www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
    - d. Tremco Commercial Sealants & Waterproofing; Tremflex 834:  
[www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- E. Type JS-2 - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.

#### **2.04 SELF-LEVELING JOINT SEALANTS**

- A. Type JS-3 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
  - 1. Movement Capability: Plus and minus 25 percent, minimum.
  - 2. Color: To be selected by Architect from manufacturer's full range.
  - 3. Products:
    - a. Pecora Corporation; DynaTred: [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - b. Sika Corporation; Sikaflex-1c SL: [www.usa.sika.com/#sle](http://www.usa.sika.com/#sle).
- B. Type \_\_\_ - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
  - 1. Movement Capability: Plus and minus 25 percent, minimum.
- C. Type JS-13 - Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.
  - 1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.
- D. Type JS-13 - Semi-Self-Leveling Polyurethane Sealant: Intended for expansion joints in sidewalks, swimming pool decks, plazas, floors and other horizontal surfaces with up to 6 percent slope.
  - 1. Composition: Single component.
  - 2. Durometer Hardness, Type A: 35 to 45, minimum, when tested in accordance with ASTM D2240.
  - 3. Color: To be selected by Architect from manufacturer's custom colors.
  - 4. Products:
    - a.
    - b. Tremco Commercial Sealants & Waterproofing; Vulkem 445 SSL:  
[www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
    - c. Substitutions: See Section 016000 - Product Requirements.

## **2.05 ACCESSORIES**

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
  - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
  - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
  - 3. Record each test on Preinstallation Adhesion Test Log as indicated.
  - 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
  - 5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

### **3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

### **3.03 INSTALLATION**

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.

- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Owner will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.
- E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- F. Repair destructive test location damage immediately after evaluation and recording of results.

#### **3.05 POST-OCCUPANCY**

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

**END OF SECTION**

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**SECTION 081113  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.

**1.02 RELATED REQUIREMENTS**

- A. Section 087100 - Door Hardware.
- B. Section 088000 - Glazing: Glass for doors and borrowed lites.
- C. Section 099123 - Interior Painting: Field painting.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.
- E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:
  - 1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 2. Curries, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 3. MPI: [www.metalproductsinc.com/sle#](http://www.metalproductsinc.com/sle#).
  - 4. Republic Doors, an Allegion brand: [www.republicdoor.com/#sle](http://www.republicdoor.com/#sle).
  - 5. Steelcraft, an Allegion brand: [www.allegion.com/#sle](http://www.allegion.com/#sle).

**2.02 PERFORMANCE REQUIREMENTS**

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.

3. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
  - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### **2.03 HOLLOW METAL DOORS**

- A. Door Finish: Factory primed and field finished.
- B. Type HM , Interior Doors, Non-Fire-Rated:
  1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 2 - Seamless.
    - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
  2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  3. Door Thickness: 1-3/4 inches, nominal.

### **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
  2. Frame Metal Thickness: 16 gauge, 0.053 inch 16 gauge, 0.053 inch, minimum.
    - a. 14 gauge, 0.067 inch minimum for openings over 4 feet, lead lined frames, and frames with automatic openings.
  3. Frame Finish: Factory primed and field finished.
- C. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- D. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

### **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

### **2.06 ACCESSORIES**

- A. Glazing: As specified in Section 088000, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

- C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

#### **3.02 PREPARATION**

#### **3.03 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 087100.
- D. Comply with glazing installation requirements of Section 088000.
- E. Coordinate installation of electrical connections to electrical hardware items.
- F. Touch up damaged factory finishes.

#### **3.04 TOLERANCES**

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

#### **3.05 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**

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**SECTION 081116  
ALUMINUM DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glazed aluminum doors.
- B. Aluminum frames.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for each type of door; include information on fabrication methods.
- C. Shop Drawings: Include elevations of each opening type.
- D. Selection Samples: Complete set of color and finish options, using actual materials, for Architect's selection.
- E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver aluminum components in manufacturer's standard protective packaging, palletted, crated, or banded together.
- B. Inspect delivered components for damage and replace. Repaired components will not be accepted.
- C. Store components in clean, dry, indoor area, under cover in manufacturer's packaging until installation.
- D. Protect materials and finish from damage during handling and installation.

**1.04 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Glazed Aluminum Doors:
  - 1. Andersen; Inswing Aluminum Pivot Door: [www.andersenwindows.com/#sle](http://www.andersenwindows.com/#sle).
  - 2. Avalon International Aluminum LLC; Eagle Universal System: [www.avalonint.com/#sle](http://www.avalonint.com/#sle).
  - 3. Manko Window Systems, Inc: [www.mankowindows.com/#sle](http://www.mankowindows.com/#sle).
  - 4. Reynaers Aluminum: [www.reynaers.com/#sle](http://www.reynaers.com/#sle).
  - 5. Terra Universal, Inc; Pre-Hung Manual Swing Doors, Aluminum: [www.terrauniversal.com/#sle](http://www.terrauniversal.com/#sle).
  - 6. Wilson Partitions: [www.wilsonpart.com/#sle](http://www.wilsonpart.com/#sle).
  - 7. Substitutions: See Section 016000 - Product Requirements.
- B. Aluminum Frames:
  - 1. AG Doors by Condoor; Condor Trimless Aluminum Door: [www.condoor.ca/#sle](http://www.condoor.ca/#sle).
  - 2. Arcadia, Inc: [www.arcadiainc.com/#sle](http://www.arcadiainc.com/#sle).
  - 3. Avalon International Aluminum LLC; Eagle Series Door Frames and Sidelights: [www.avalonint.com/#sle](http://www.avalonint.com/#sle).
  - 4. Cline Aluminum Doors, Inc: [www.clinedoors.com/#sle](http://www.clinedoors.com/#sle).
  - 5. Wilson Partitions: [www.wilsonpart.com/#sle](http://www.wilsonpart.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.

## 2.02 DOORS AND FRAMES

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Glazed Aluminum Doors: Extruded aluminum tube frame, full glazed, with middle rail; factory glazed.
  - 1. Thickness: 2 inches, nominal.
  - 2. Finish: Class I - Natural anodized.
  - 3. Seals: Manufacturer's standard.
  - 4. Glazing: See Section 088000.
- C. Aluminum Frames for Doors, Sidelights, or Transoms: Extruded aluminum, non-thermally broken hollow or C-shaped sections; no steel components.
  - 1. Frame Depth: 4-1/4 inches.
  - 2. Finish: Same as doors.
  - 3. Sidelight/Transom Glazing: See Section 088000.
- D. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
  - 1. Provide the following clearances:
    - a. Hinge and Lock Stiles: 1/8 inch.
    - b. Between Meeting Stiles: 1/4 inch.
    - c. At Top Rail and Bottom Rail: 1/8 inch.

## 2.03 COMPONENTS

- A. Frames: Extruded aluminum shapes, not less than 0.062 inch thick, reinforced at hinge and strike locations.
  - 1. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
  - 2. Trim: Extruded aluminum, not less than 0.062 inch thick, removable snap-in type without exposed fasteners.

## 2.04 MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M, alloy 5005, temper H14, stretcher leveled.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063, temper T5, or alloy 6463, temper T5.

## 2.05 FINISHES

- A. Class I Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A41, minimum dry film thickness (DFT) of 0.7 mils, 0.0007 inch.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

## 2.06 ACCESSORIES

- A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
- B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel or steel hot-dip galvanized in compliance with ASTM A123/A123M.
- C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil thickness per coat.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.



### **3.02 PREPARATION**

- A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.
- B. Replace components with damage to exposed finishes.
- C. Separate dissimilar metals to prevent electrolytic action between metals.

### **3.03 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.
- B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.
- C. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.
- D. Hang doors and adjust hardware to achieve specified clearances and proper door operation.
- E. Comply with glazing installation requirements. See Section 088000.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Provide field testing of installed aluminum doors by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
  - 1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
  - 2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf.
- C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

### **3.05 CLEANING**

- A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609 & 610.
- B. Do not use abrasive, caustic, or acid cleaning agents.

### **3.06 PROTECTION**

- A. Protect products of this section from damage caused by subsequent construction until Date of Final Acceptance.
- B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

**END OF SECTION**

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**SECTION 081416  
FLUSH WOOD DOORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Flush wood doors; flush configuration; non-rated.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door veneer, 8 by 10 inches in size illustrating wood grain, stain color, and sheen.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

**1.04 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
  - 1. Haley Brothers; \_\_\_\_: [www.haleybros.com/#sle](http://www.haleybros.com/#sle).
  - 2. Krieger Specialty Products; \_\_\_\_: [www.kriegerproducts.com/#sle](http://www.kriegerproducts.com/#sle).
  - 3. Masonite Architectural; Aspiro Select Wood Veneer Doors:  
[www.architectural.masonite.com/#sle](http://www.architectural.masonite.com/#sle).
  - 4. VT Industries, Inc; \_\_\_\_: [www.vtindustries.com/#sle](http://www.vtindustries.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.

**2.02 DOORS AND PANELS**

- A. Doors: See drawings for locations and additional requirements.
  - 1. Quality Standard: Premium Grade, Extra Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at each location.

**2.03 DOOR AND PANEL CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

## **2.04 DOOR FACINGS**

- A. Veneer Facing for Transparent Finish: White oak, veneer grade in accordance with quality standard indicated, rift cut (only red and white oak), with book match between leaves of veneer, center balance match of spliced veneer leaves assembled on door or panel face.
  - 1. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

## **2.05 DOOR CONSTRUCTION**

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

## **2.06 FINISHES - WOOD VENEER DOORS**

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
- B. Factory finish doors in accordance with approved sample.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

### **3.02 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.

### **3.03 TOLERANCES**

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

### **3.04 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**END OF SECTION**

## SECTION 08 71 00 – DOOR HARDWARE

## GENERAL

## 1.01 RELATED DOCUMENTS

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

## 1.02 SUMMARY

## A. Section includes:

- 1. Mechanical and electrified door hardware for:
  - a. Swinging doors.
  - b. Sliding doors.
- 2. Electronic access control system components, including:
  - a. Electronic access control devices.

## B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

- 1. Windows
- 2. Cabinets (casework), including locks in cabinets
- 3. Signage
- 4. Toilet accessories
- 5. Overhead doors

## C. Related Sections:

- 1. Division 01 Section “Alternates” for alternates affecting this section.
- 2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
- 3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
- 4. Division 13 Section “Radiation Protection” for requirements for lead-lining for door hardware at openings indicated to receive radiation protection.
- 5. Division 26 sections for connections to electrical power system and for low-voltage wiring.
- 6. Division 28 sections for coordination with other components of electronic access control system.

## 1.03 REFERENCES

## A. UL - Underwriters Laboratories

- 1. UL 10B - Fire Test of Door Assemblies
- 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
- 3. UL 1784 - Air Leakage Tests of Door Assemblies
- 4. UL 305 - Panic Hardware

## B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

## C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

## 1.04 SUBMITTALS

## A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

## B. Action Submittals:

1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
  - a. Wiring Diagrams: For power, signal, and control wiring and including:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
  - a. Door Index; include door number, heading number, and Architects hardware set number.
  - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
  - c. Type, style, function, size, and finish of each hardware item.
  - d. Name and manufacturer of each item.
  - e. Fastenings and other pertinent information.
  - f. Location of each hardware set cross-referenced to indications on Drawings.
  - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
  - h. Mounting locations for hardware.
  - i. Door and frame sizes and materials.
  - j. Name and phone number for local manufacturer's representative for each product.

- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
    - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
  5. Key Schedule:
    - a. All keying shall be provided by NCSU Lockshop
  6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.
- C. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
  2. Product Certificates for electrified door hardware, signed by manufacturer:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  3. Certificates of Compliance:
    - a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
    - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
    - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
  4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
  5. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
    - e. Final approved hardware schedule, edited to reflect conditions as installed.
    - f. Final keying schedule
    - g. Copies of floor plans with keying nomenclature
    - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

## 1.05 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
  - 1. Where products indicate “acceptable manufacturers” or “acceptable manufacturers and products”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
  - 1. Warehousing Facilities: In Project's vicinity.
  - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
  - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
  - 4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
    - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
  - 2. Can provide installation and technical data to Architect and other related subcontractors.
  - 3. Can inspect and verify components are in working order upon completion of installation.
  - 4. Capable of producing wiring diagrams.
  - 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
  - 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- I. Keying Conference:
  - 1. Owner to conduct keying conference inviting required attendees as needed.
- J. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Inspect and discuss preparatory work performed by other trades.
  - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
  - 4. Review sequence of operation for each type of electrified door hardware.
  - 5. Review required testing, inspecting, and certifying procedures.
- K. Coordination Conferences:
  - 1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
    - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
  - 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
    - a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
    - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
  - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
  - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.



2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
1. Promptly replace products damaged during shipping.
  2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
  3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 1.07 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Direct shipments not permitted, unless approved by Contractor.

#### 1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Years from date of Final Acceptance, for durations indicated.
    - a. Closers:
      - 1) Mechanical: 30 years.
    - b. Exit Devices:
      - 1) Mechanical: 3 years.
      - 2) Electrified: 1 year.
    - c. Locksets:
      - 1) Mechanical: 10 years.
      - 2) Electrified: 1 year.
    - d. Continuous Hinges: Lifetime warranty.
    - e. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

#### 1.09 MAINTENANCE

##### A. Extra Materials:

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents in quantities as determined by Owner.

##### B. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

### PRODUCTS

#### 2.01 MANUFACTURERS

- A. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

#### 2.02 MATERIALS

##### A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

## 2.03HINGES

### A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product: Ives 5BB series
- 2. Acceptable Manufacturers and Products: Hager BB series, Stanley FBB Series

### B. Requirements:

- 1. Provide five-knuckle ball bearing hinges conforming to ANSI/BHMA A156.1.
- 2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
- 3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Heavy weight, steel, 4-1/2 inches (114 mm) high
- 4. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
- 5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
- 6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
- 7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

## 2.04ELECTRIC POWER TRANSFER

### A. Manufacturers:

- 1. Scheduled Manufacturer and Product:
  - a. Von Duprin EPT-10
- 2. Acceptable Manufacturers and Products:
  - a. Securitron CEPT-10
  - b. Security Door Controls PTM

## B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.05MORTISE LOCKS

## A. Manufacturers and Products:

1. Owner Preferred Manufacturer and Product: Best 45H Series, Schlage L9000 series
2. Acceptable Manufacturers and Products: Dorma ML 9000 series

## B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

## 2.06CYLINDERS

## A. Manufacturers:

1. Owner Preferred Manufacturer: Schlage
2. Acceptable Manufacturer: Best, Sargent

## B. Requirements:

1. Provide small format interchangeable core (SFIC) cylinders/cores zero bitted with uncut key blanks to match Owner's existing Schlage key system, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Replaceable Construction Cores.
  - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
    - 1) 3 construction control keys
    - 2) 12 construction change (day) keys.
  - b. Provide and install construction cores for electronic wireless locks supplied by Security Contractor.

- c. Provide permanent cores, zero bitted, to Owner as directed.
- d. Owner will replace temporary construction cores with permanent cores.

## 2.07KEYING

### A. Keying to be performed by Owner.

1. Provide Uncut keys with the following features:
  - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
  - b. Patent Protection: Keys and blanks protected by one or more utility patent(s) the year, 2029.
2. Quantity: Furnish in the following quantities.
  - a. 3 per cylinder/core.

## 2.08DOOR CLOSERS

### A. Manufacturers and Products:

1. Owner Preferred Manufacturer and Product: LCN 4010/4110 series
2. Acceptable Manufacturers and Products: Sargent 281/281P10 series factory assembled (without PRV), Norton 9500/PR9500 series (without PRV).

### B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter, with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.09DOOR TRIM

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

## B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

## 2.10 PROTECTION PLATES

## A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

## B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges, with countersunk screw holes as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
  - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

## 2.11 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

## A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

## B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.

3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

## 2.12 DOOR STOPS AND HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

### B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

## 2.13 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer: Zero International
2. Acceptable Manufacturers: National Guard, Reese

### B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
  - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
  - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

## 2.14 SILENCERS

### A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Rockwood

### B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.

2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

## 2.15 FINISHES

- A. Finish: BHMA 626/652 (US26D); except:
  1. Hinges at Exterior Doors: BHMA 630 (US32D)
  2. Continuous Hinges: BHMA 628 (US28)
  3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
  4. Protection Plates: BHMA 630 (US32D)
  5. Overhead Stops and Holders: BHMA 630 (US32D)
  6. Door Closers: Powder Coat to Match
  7. Wall Stops: BHMA 630 (US32D)
  8. Latch Protectors: BHMA 630 (US32D)
  9. Weatherstripping: Clear Anodized Aluminum
  10. Thresholds: Mill Finish Aluminum

## EXECUTION

### 3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Where on-site modification of doors and frames is required:
  1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
  2. Field modify and prepare existing door and frame for new hardware being installed.
  3. When modifications are exposed to view, use concealed fasteners, when possible.
  4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.



## 3.03 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Provide construction cores for any lock provided by security provider.
  - 2. Furnish permanent cores to Owner for installation.
- I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
  - 1. Conduit, junction boxes and wire pulls.
  - 2. Connections to and from power supplies to electrified hardware.
  - 3. Connections to fire/smoke alarm system and smoke evacuation system.
  - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  - 5. Testing and labeling wires with Architect's opening number.
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed on door and system headend details.
  - 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

- M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.04 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.
  - 2. Owner will inspect door hardware and provide final punch list prior to Building Occupancy inspection.

### 3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Final Acceptance, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Final Acceptance.

3.07 DEMONSTRATION

- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.08 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

Door#	HwSet#
<del>1337</del> 1337A	03
1363	02
<del>1365</del> 1365A	01

Hardware Group No. 01

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 <del>6</del>	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	L9070BDC 17A	626	SCH
1	EA	SFIC CORE	80-036	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE (VERIFY WITH OWNER)	8400 10" X 1 1/2" LDW B-CS	630	IVE
1 <del>2</del>	EA	WALL STOP	WS406/407CVX	630	IVE
1 <del>2</del>	EA	SILENCER	SR64	GRY	IVE

COORDINATE WITH ELECTRICAL AND SECURITY. ENTRY BY CREDENTIAL OR KEY OVERRIDE. PRESENTING VALID CREDENTIAL TO CARD READER LOCK WILL MOMENTARILY UNLOCK LOCK AND ALLOW ENTRY.

UPON LOSS OF POWER DOOR IS LOCKED. DOOR IS ALWAYS AVAILABLE FOR FREE EGRESS. DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

Hardware Group No. 02

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 <del>6</del>	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	WIRELESS LOCK	LEBMS-ADDL-17 BATTERY OPERATED (SUPPLIED AND INSTALLED BY OWNER) (VERIFY)	626	SCE
1	EA	SFIC CORE	80-036	626	SCH
<del>1</del>	<del>EA</del>	<del>COORDINATOR</del>	<del>COR X FL</del>	<del>628</del>	<del>IVE</del>
2	EA	MOUNTING BRACKET	MB	689	IVE
1 <del>2</del>	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE (TO BE REMOVED).	8400 10" X 1 1/2" LDW B-CS	630	IVE
1 <del>2</del>	EA	SILENCER	SR64	GRY	IVE

COORDINATE WITH ELECTRICAL AND SECURITY. ENTRY BY CREDENTIAL OR KEY OVERRIDE. PRESENTING VALID CREDENTIAL TO CARD READER LOCK WILL MOMENTARILY UNLOCK LOCK AND ALLOW ENTRY.

UPON LOSS OF POWER DOOR IS LOCKED. DOOR IS ALWAYS AVAILABLE FOR FREE EGRESS. DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

Hardware Group No. 03

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	PASSAGE SET (CONFIRM OPERATION CLASSROOM, OFFICE?)	L9010 17A	626	SCH
1	EA	OH STOP (OWNER TO VERIFY OVERHEAD OPERATION)	90S	630	GLY
1	EA	SURFACE CLOSER	4011	689	LCN
2	EA	KICK PLATE (VERIFY WITH OWNER)	8400 10" X 1 1/2" LDW B-CS	630	IVE

COORDINATE WITH ELECTRICAL AND SECURITY.  
 LESS LEVER ON EXTERIOR.  
 DOOR IS ALWAYS AVAILABLE FOR FREE EGRESS.  
 DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM FOR MONITORING.

**END OF SECTION**

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**SECTION 088000  
GLAZING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glazing units.
- B. Glazing compounds.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

**1.05 FIELD CONDITIONS**

**1.06 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Float Glass Manufacturers:
  - 1. Guardian Glass, LLC: [www.guardianglass.com/#sle](http://www.guardianglass.com/#sle).
  - 2. Pilkington North America Inc: [www.pilkington.com/na/#sle](http://www.pilkington.com/na/#sle).
  - 3. Vitro Architectural Glass (formerly PPG Glass): [www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).

**2.02 GLASS MATERIALS**

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
  - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
  - 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

### **2.03 GLAZING UNITS**

- A. Type G1 - Monolithic Interior Vision Glazing:
  1. Applications: Interior glazing unless otherwise indicated.
  2. Glass Type: Annealed float glass.
  3. Tint: Clear.
  4. Thickness: 1/4 inch, nominal.
- B. Type G1 - Monolithic Safety Glazing: Non-fire-rated.
  1. Applications:
    - a. Glazed lites in doors, except fire doors.
    - b. Sliding glass doors.
    - c. Glazed sidelights to doors, except in fire-rated walls and partitions.
    - d. Other locations required by applicable federal, state, and local codes and regulations.
    - e. Other locations indicated on drawings.
  2. Glass Type: Fully tempered safety glass as specified.
  3. Tint: Clear.
  4. Thickness: 1/4 inch, nominal.

### **2.04 ACCESSORIES**

- A. Setting Blocks: Silicone, with 60 to 70 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

## **PART 3 EXECUTION**

### **3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

### **3.03 INSTALLATION, GENERAL**

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

#### **3.04 FIELD QUALITY CONTROL**

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

#### **3.05 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Final Acceptance in accordance with glass manufacturer's written recommendations.

#### **3.06 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Final Acceptance.

**END OF SECTION**



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**SECTION 090561  
COMMON WORK RESULTS FOR FLOORING PREPARATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
  - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Remedial floor coatings.

**1.02 PRICE AND PAYMENT PROCEDURES**

- A. Unit Price for Alternate Flooring Adhesive: Do not include the cost of the alternate adhesive in the base bid; state on the bid form the unit price per square foot for using the alternate adhesive, in the event such remediation is required.
- B. Unit Price for Remedial Floor Coating or Sheet Membrane: Do not include the cost of the floor coating or underlayment in the base bid; state on the bid form the unit price per square foot for the floor coating or underlayment, installed, in the event such remediation is required.
  - 1. Base the unit price on a total quantity of 10,000 square feet.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.
- B. Preinstallation Meeting: Convene two weeks before starting concrete substrate where flooring will be installed.
  - 1. Review preparation and flooring installation procedures, concrete mix design, and moisture emission mitigation efforts.
  - 2. Required attendees to include concrete mix provider, concrete subcontractor, and flooring manufacturers.

**1.04 SUBMITTALS**

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
  - 1. Moisture and alkalinity (pH) limits and test methods.
  - 2. Manufacturer's required bond/compatibility test procedure.
- C. Testing Agency's Report:
  - 1. Description of areas tested; include floor plans and photographs if helpful.
  - 2. Summary of conditions encountered.
  - 3. Moisture and alkalinity (pH) test reports.
  - 4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.
  6. Product data for recommended remedial coating.
  7. Submit report to Architect.
  8. Submit report not more than two business days after conclusion of testing.
- D. Adhesive Bond and Compatibility Test Report.
- E. Copy of RFCI (RWP).

### **1.05 QUALITY ASSURANCE**

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
  2. Confirm date of start of testing at least 10 days prior to actual start.
  3. Allow at least 4 business days on site for testing agency activities.
  4. Achieve and maintain specified ambient conditions.
  5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

### **1.07 FIELD CONDITIONS**

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
  2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
  3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
  - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
  - 2. Use product recommended by testing agency.

### **PART 3 EXECUTION**

#### **3.01 CONCRETE SLAB PREPARATION**

- A. Perform following operations in the order indicated:
  - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
    - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
    - b. Removal of existing floor covering.
  - 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
    - a. Remove existing coatings and curing agents from surface according to recommendations of remedial coating manufacturer.
    - b. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
  - 3. Preliminary cleaning.
  - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
  - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  - 7. Specified remediation, if required.
  - 8. Patching, smoothing, and leveling, as required.
  - 9. Other preparation specified.
  - 10. Adhesive bond and compatibility test.
  - 11. Protection.
- B. Remediations:
  - 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
  - 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
  - 3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

### **3.02 REMOVAL OF EXISTING FLOOR COVERINGS**

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

### **3.03 PRELIMINARY CLEANING**

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

### **3.04 MOISTURE VAPOR EMISSION TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

### **3.05 INTERNAL RELATIVE HUMIDITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

### **3.06 ALKALINITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
  - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
  3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

### **3.07 PREPARATION**

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

### **3.08 ADHESIVE BOND AND COMPATIBILITY TESTING**

- A. Comply with requirements and recommendations of floor covering manufacturer.

### **3.09 APPLICATION OF REMEDIAL FLOOR COATING**

- A. Comply with requirements and recommendations of coating manufacturer.

**END OF SECTION**

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**SECTION 092116  
GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data:
  - 1. Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
  - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. 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.
- D. Evaluation Service Reports: Show compliance of grid suspension systems with specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. SFIA Code Compliance Certification Program: [www.CFSteel.org/#sle](http://www.CFSteel.org/#sle): Use metal studs and connectors certified for compliance with International Building Code.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.
- C. Store metal products to prevent corrosion.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
  - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:
  - 1. ICC-ES Evaluation Report No. ESR-1222 or similar.

### **2.02 METAL FRAMING MATERIALS**

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
  - 1. Structural Grade: As required to meet design criteria.
  - 2. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.
- B. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf.
  - 1. Studs: C-shaped with ribbed webs, and flanges with rolled edge stiffeners.
    - a. Thickness: 18 mils, 0.0181 inch (20 GA EQ), minimum.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
  - 4. Furring Members: Zee-shaped sections, minimum depth of 1 inch.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
  - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
  - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
- D. Non-structural Framing Accessories:
  - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
  - 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
    - a. Height: Provide tallest standard height that will fit within partial height wall framing.
    - b. Location: Provide at all floor supported partial height walls and where indicated on the drawings.
    - c. Products:
      - 1) ClarkDietrich; Pony Wall (PW): [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
      - 2) SCAFCO Corporation; Ponywall Support: [www.scafco.com/#sle](http://www.scafco.com/#sle).
- E. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.

### **2.03 BOARD MATERIALS**

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
3. Thickness:
  - a. Vertical Surfaces: 5/8 inch.
  - b. Ceilings: 5/8 inch.
  - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
4. Paper-Faced Products:
  - a. CertainTeed Corporation; Type X Drywall: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - b. Georgia-Pacific Gypsum; ToughRock Fireguard X: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  - c. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): [www.usg.com/#sle](http://www.usg.com/#sle).

#### **2.04 GYPSUM BOARD ACCESSORIES**

- A. Acoustic Insulation: ASTM C665; preformed rock wool, friction fit type, unfaced; thickness 3 inch.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
  1. Partition End Cap: Rigid plastic end cap with 1-1/8 inch flange; sized for partition width.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  2. Joint Compound: Drying type, vinyl-based, ready-mixed.
  3. Joint Compound: Setting type, field-mixed.
- E. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
  1. Products:
    - a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfer with M2Tech: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. USG Corporation; USG Sheetrock Brand Tuff-Hide Primer-Surfer: [www.usg.com/#sle](http://www.usg.com/#sle).
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- G. Flat Strap Backing: 0.0566 inch minimum thickness or as required to support load. Span 3 studs minimum.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

#### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C1007, AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
  1. Level ceiling system to a tolerance of 1/1200.



2. Laterally brace entire suspension system.
- C. Studs: Space studs at 16 inches on center.
  1. Extend partition framing to structure in all locations, unless otherwise indicated.
  2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
  1. Orientation: Horizontal.
  2. Spacing: At 24 inches on center.
- F. Blocking: Install mechanically fastened steel sheet blocking for support of:
  1. Framed openings.
  2. Wall-mounted cabinets.
  3. Plumbing fixtures.
  4. Toilet partitions.
  5. Toilet accessories.
  6. Wall-mounted door hardware.
  7. Other locations as required.

### **3.03 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
  1. Place continuous bead at perimeter of base layer of gypsum board on each side of partition.
  2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

### **3.04 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Install gypsum board with 1/2 inch clearance above floor.
- C. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
  1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- D. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- E. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- F. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

- G. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
  - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- H. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

### **3.05 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
  - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

### **3.06 JOINT TREATMENT**

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with setting type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 3. Level 3: Walls to receive textured wall finish.
  - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding are not required at base layer of double-layer applications.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

### **3.07 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

### **3.08 CLEANING**

- A. Clean \_\_\_\_\_.

### **3.09 PROTECTION**

- A. Protect installed gypsum board assemblies from subsequent construction operations.

**END OF SECTION**

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**SECTION 095100  
ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 x 6 inch in size illustrating material and finish of acoustical units.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

**1.04 QUALITY ASSURANCE**

- A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**1.05 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Acoustic Tiles/Panels:
  - 1. As indicated on drawings.
- B. Suspension Systems:
  - 1. Same as for acoustical units.

**2.02 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:
  - 1. UL (FRD) Assembly Design No. as indicated by applicable testing agency.

### 2.03 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Products: As indicated on drawings.
- C. Acoustical Tiles, Type ACT1: Painted fiberglass, with the following characteristics:
  - 1. Classification: ASTM E1264 Type III.
  - 2. Size: As indicated on drawings
  - 3. Thickness: 1 inch.
  - 4. Panel Edge: Square.
  - 5. Tile Edge: Beveled.
    - a. Joint: Kerfed and rabbeted.
  - 6. Color: White.
  - 7. Suspension System: Exposed grid. 9/16"
- D. Acoustical Panels, Type ACT2: Painted mineral fiber, with the following characteristics:
  - 1. Classification: ASTM E1264 Type III.
  - 2. Size: 24 by 24 inches.
  - 3. Size: As indicated on drawings
  - 4. Thickness: 1 inch.
  - 5. Panel Edge: Square.
  - 6. Tile Edge: Beveled. Joint: Kerfed and rabbeted.
    - a. Joint: Kerfed and rabbeted.
  - 7. Color: White.
  - 8. Suspension System[<>]: Exposed grid. 9/16"

### 2.04 SUSPENSION SYSTEM(S)

- A. Products: As indicated on drawings.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
  - 1. Materials:
    - a. As indicated on drawings.

### 2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
  - 1. Size: As required for installation conditions and specified Seismic Design Category.
  - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. Metal Edge Trim for Suspension Systems: Extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
  - 1. Trim Height: As indicated on drawings.
  - 2. Finish: Baked enamel.
  - 3. Color: Match grid color.
  - 4. Products:
    - a. USG Corporation; Compasso Suspension Trim: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
    - b. Armstrong; Axiom Trim: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).

- F. Touch-up Paint: Type and color to match acoustical and grid units.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

#### **3.02 PREPARATION**

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

#### **3.03 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Use longest practical lengths.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

#### **3.04 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
  - 1. Make field cut edges of same profile as factory edges.
- F. Install hold-down clips on each panel in areas indicated on drawings to retain panels tight to grid system; comply with fire rating requirements.

#### **3.05 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

### **3.06 CLEANING**

- A. Clean surfaces.
- B. Replace damaged or abraded components.

**END OF SECTION**

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**SECTION 096500  
RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, \_\_\_ by \_\_\_ inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Flooring Material: 5 percent of each type and color.
  - 3. Extra Wall Base: 10 linear feet of each type and color.

**1.03 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

**1.05 FIELD CONDITIONS**

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

**PART 2 PRODUCTS**

**2.01 SHEET FLOORING**

- A. Vinyl Sheet Flooring - Type SV-: Homogeneous without backing, with color and pattern throughout full thickness.
  - 1. Products: As indicated on drawings.

2. Minimum Requirements: Comply with ASTM F1913.
  3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  4. Thickness: 0.080 inch nominal.
  5. Static Load Resistance: 250 psi minimum, when tested as specified in ASTM F970.
  6. Seams: Heat welded.
  7. Integral coved base with cap strip.
  8. Pattern: As indicated on drawings.
  9. Color: As indicated on drawings.
- B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

## 2.02 RESILIENT BASE

- A. Resilient Base - Type RB: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
1. Products: As indicated on drawings.
  2. Manufacturers:
    - a. Flexco Corporation; Wallflowers Wall Base: [www.flexcofloors.com/#sle](http://www.flexcofloors.com/#sle).
    - b. Johnsonite, a Tarkett Company; Baseworks Thermoset Rubber: [www.johnsonite.com/#sle](http://www.johnsonite.com/#sle).
    - c. Mannington Commercial; Premium TS Molded Wall Base: [www.manningtoncommercial.com/#sle](http://www.manningtoncommercial.com/#sle).
    - d. Roppe Corporation; Pinnacle Rubber Base: [www.roppe.com/#sle](http://www.roppe.com/#sle).
  3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  4. Height: As indicated on drawings.
  5. Thickness: 0.125 inch.
  6. Finish: Satin.
  7. Length: Roll.
  8. Color: As indicated on drawings.

## 2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: As indicated on drawings.
- D. Prefabricated Coved Base: Bonded Aluminum Reinforcing Backer.
1. Manufacturers:
    - a. Roppe Corporation; Flashcove Puncture-Proof Reinforced Bases: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - b. Substitutions: Section 016000 - Product Requirements.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.



- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

### **3.02 PREPARATION**

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
  - 1. Spread only enough adhesive to permit installation of materials before initial set.
  - 2. Fit joints and butt seams tightly.
  - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers, maintaining floor pattern.

### **3.04 INSTALLATION - SHEET FLOORING**

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Seal seams by heat welding where indicated.
- C. Coved Base: Install as detailed on drawings, using prefabricated coved base as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

### **3.05 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

### **3.06 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

### **3.07 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

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**SECTION 096813  
TILE CARPETING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Installer's Qualification Statement.
- F. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

**1.03 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

**1.04 FIELD CONDITIONS**

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Tile Carpeting, Type CPT-: Tufted, manufactured in one color dye lot.
  - 1. Product: As indicated on drawings.
  - 2. Size: As indicated on drawings.
  - 3. Color: As indicated on drawings.
  - 4. Pattern: As indicated on drawings.
  - 5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
  - 6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
  - 7. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
  - 8. Primary Backing Material: Manufacturer's standard composite material.

**2.02 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: As indicated in drawings, color as selected by Architect.
- C. Adhesives:
  - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 016116.

- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 090561.
  2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
  3. Follow moisture and alkalinity remediation procedures in Section 090561.
- D. Verify that required floor-mounted utilities are in correct location.

#### **3.02 PREPARATION**

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

#### **3.03 INSTALLATION**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in pattern as indicated in drawings.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

#### **3.04 CLEANING**

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

**END OF SECTION**

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**SECTION 098430  
SOUND-ABSORBING WALL AND CEILING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sound-absorbing panels.
- B. Sound-absorbing ceiling baffles.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

**PART 2 PRODUCTS**

**2.01 FIBERGLASS SOUND-ABSORBING UNITS**

- A. Rigid Fiberglass Board for Walls and Ceilings:
  - 1. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.80 for 2" thick boards spaced 12" O.C. when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
  - 2. Surface Burning Characteristics: ASTM E 1264; Class A (UL)
  - 3. Edge Profile: Square
  - 4. Color: As indicated on drawings..

**2.02 FABRICATION**

- A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.
- B. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

**2.03 ACCESSORIES**

- A. Tensioned Cable System: Manufacturer's standard accessories for mounting conditions and spans indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- C. Install mounting accessories and supports in accordance with shop drawings.
- D. Suspend ceiling baffles at locations and heights as indicated.
- E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
  - 1. Plumb and level.
  - 2. Flatness.

### **3.03 CLEANING**

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

### **3.04 PROTECTION**

- A. Provide protection of installed acoustical panels until Date of Final Acceptance.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

**END OF SECTION**

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**SECTION 099123  
INTERIOR PAINTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
  - 1. Prime surfaces to receive wall coverings.
  - 2. Mechanical and Electrical:
    - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    - b. In finished areas, paint shop-primed items.
    - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    - d. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
  - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
  - 6. Floors, unless specifically indicated.
  - 7. Ceramic and other tiles.
  - 8. Glass.
  - 9. Acoustical materials, unless specifically indicated.
  - 10. Concealed pipes, ducts, and conduits.

**1.02 DEFINITIONS**

- A. Comply with ASTM D16 for interpretation of terms used in this section.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
  - 2. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.
  - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
  - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.

4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and factory finished metals, have been approved.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit coating maintenance manual including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.
  2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
  3. Label each container with color in addition to the manufacturer's label.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.06 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 fc measured mid-height at substrate surface.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
  1. Benjamin Moore: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  2. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  3. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- C. Primer Sealers: Same manufacturer as top coats.

#### **2.02 PAINTS AND FINISHES - GENERAL**

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
  1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
  4. Supply each paint material in quantity required to complete entire project's work from a single production run.
  5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: See Section 016116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: As indicated on drawings.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

### 2.03 PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
  2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
    - a. Products:
      - 1) PPG Paints Speedhide Zero Interior Latex, 6-70ZV Series, Flat. (MPI #143)
      - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
      - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
      - 4) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss.
  3. Top Coat(s): Interior Latex.
    - a. Products:
      - 1) Benjamin Moore; Zero VOC Ultra Spec 500 Interior Flat Paint.
      - 2) Benjamin Moore; Zero VOC Ultra Spec 500 Interior Eggshell Paint.
      - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
      - 4) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #52)
  4. Top Coat Sheen:
    - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
    - b. Eggshell: MPI gloss level 3; use this sheen for \_\_\_\_\_.
  5. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
  2. Two top coats and one coat primer.
  3. Top Coat(s): Interior Alkyd, Water Based; MPI #157, 167, 168, or 169.
    - a. Products:
      - 1) Benjamin Moore; 0793 Advance Waterborne Interior Alkyd Paint; Semi-Gloss
      - 2) PPG Paints Speedhide Interior/Exterior WB Alkyd, 6-1510XI Series, Semi-Gloss.
      - 3) Sherwin-Williams; Pro Industrial Waterbased Alkyd Urethane, B53 Series, Semi-Gloss.
  4. Top Coat Sheen:



- a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
5. Primer: As recommended by top coat manufacturer for specific substrate.
- C. Medium Duty Vertical and Overhead: Including gypsum board, concrete, concrete masonry units, uncoated steel, shop primed steel, and galvanized steel.
  1. Two top coats and one coat primer.
  2. Top Coat(s): Interior Epoxy-Modified Latex.
    - a. Location: As indicated on drawings.
    - b. Products:
      - 1) Benjamin Moore; Corotech V450 Acrylic Epoxy
      - 2) PPG Paints Aquapon WB EP Two-Component Waterborne Epoxy Coating, 98E-1/98E-100 Series, Semi-Gloss. (MPI #215)
      - 3) Sherwin-Williams Pro Industrial Waterbased Catalyzed Epoxy, B73 Series Gloss. (MPI #115)
  3. Top Coat Sheen:
    - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
  4. Primer: As recommended by top coat manufacturer for specific substrate.
- D. Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
  1. Shop primer by others.
  2. One top coat.
  3. Top Coat: Latex Dry Fall.
    - a. Products:
      - 1) Benjamin Moore; Coronado N110 Super Kote 5000 Dry Fall Latex Flat
      - 2) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog Latex, 6-725XI Series, Flat. (MPI #118)
      - 3) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118)
  4. Top Coat Sheen:
    - a. Flat: MPI gloss level 1; use this sheen at all locations.
  5. Primer: As recommended by top coat manufacturer for specific substrate.

## **2.04 PRIMERS**

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

## **2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.

- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
  - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
  - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
  - 3. Clean concrete according to ASTM D4258. Allow to dry.
  - 4. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- F. Masonry:
  - 1. Prepare surface as recommended by top coat manufacturer.
  - 2. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces:
- I. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- K. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### 3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

#### **3.04 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

#### **3.05 PROTECTION**

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes prior to Date of Final Acceptance.

**END OF SECTION**

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**SECTION 099600  
HIGH-PERFORMANCE COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. High performance coatings.
- B. Surface preparation.

**1.02 RELATED REQUIREMENTS**

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 099123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
  - 3. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
- C. Samples: Submit two samples 8 by 8 inch in size illustrating colors for selection.
- D. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Coating Materials: 1 gallon of each type and color.
  - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

**1.04 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document that applies to application on site.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

**1.06 FIELD CONDITIONS**

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.
- C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

- D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- E. Restrict traffic from area where coating is being applied or is curing.

### **1.07 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Final Acceptance.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide high performance coating products from the same manufacturer to the greatest extent possible.
  - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. High-Performance Coatings:
  - 1. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 2. Sika Corporation: [www.sikafloorusa.com/#sle](http://www.sikafloorusa.com/#sle).
  - 3. Sherwin-Williams Company: [www.protective.sherwin-williams.com/industries/#sle](http://www.protective.sherwin-williams.com/industries/#sle).
  - 4. Tnemec Company, Inc: [www.tnemec.com/#sle](http://www.tnemec.com/#sle).
  - 5. Substitutions: Section 016000 - Product Requirements.

### **2.02 HIGH-PERFORMANCE COATINGS**

- A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
  - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
  - 2. NFPA 101, Class A rated.

### **2.03 TOP COAT MATERIALS**

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
  - 1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
  - 2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
  - 3. Volatile Organic Compound (VOC) Content: See Section 016116.
- B. Elastomeric Coating for exterior concrete:
  - 1. Number of Coats: Two.
  - 2. Product Characteristics:
    - a. Percentage of solids by volume, 100, minimum.
    - b. Dry film thickness, per coat, 8, minimum.
    - c. Comply with the performance requirements specified above for moderate exposure.
  - 3. Top Coat(s): Exterior Pigmented Elastomeric, Water Based.
    - a. Sheen: Flat.
    - b. Products:
      - 1) Sika; MasterProtect EL 750: [www.sika.com/#sle](http://www.sika.com/#sle).
      - 2) PPG Paints; Perma-Crete Pitt-Flex Elastomeric Coating, 4-110XI Series, Flat: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle). (MPI #113)
      - 3) Tnemec Company, Inc; Series 156 Enviro-Crete: [www.tnemec.com/#sle](http://www.tnemec.com/#sle).

- C. Urethane Coating for exterior steel elements, including handrails and lintels:
1. Number of Coats: Two.
  2. Top Coat(s): Polyurethane, Two-Component.
    - a. Sheen: Semi-Gloss.
    - b. Products:
      - 1) PPG Paints; Pitthane Ultra Polyurethane Enamel, 95-8001 Series, Gloss: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle). (MPI #72) Provide PPG Paints; Pitt-Guard Rapid-Coat DTR Epoxy Mastic as Primer.
      - 2) Sherwin-Williams; Acrolon 218 HS: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle). (MPI #72, #174) Provide Sherwin-Williams; Maxropoxy 646 Fast Cure as primer.
      - 3) Tnemec Company, Inc; Series 1075 Endura-Shield II: [www.tnemec.com/#sle](http://www.tnemec.com/#sle). Provide Tnemec; Series 104 H.S. Epoxy as Primer.
  3. Primer: As recommended by coating manufacturer for specific substrate.

#### **2.04 PRIMERS**

- A. Primers: Provide the following unless other primer is required or recommended by coating manufacturer.

#### **2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Test shop-applied primer for compatibility with subsequent cover materials.
- G. Proceed with coating application only after unacceptable conditions have been corrected.
  1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

#### **3.02 PREPARATION**

- A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
- B. Clean surfaces of loose foreign matter.
- C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- D. Remove finish hardware, fixture covers, and accessories and store.
- E. Galvanized Surfaces:
  1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  2. Prepare surface according to SSPC-SP 2.

- F. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

### **3.03 PRIMING**

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

### **3.04 COATING APPLICATION**

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

### **3.05 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

### **3.06 PROTECTION**

- A. Protect finished work from damage.

### **3.07 SCHEDULE**

- A. Color: As indicated on Finish Schedule or from manufacture's full range of color.

**END OF SECTION**

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**SECTION 101100  
VISUAL DISPLAY UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Porcelain enamel steel markerboards.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide manufacturer's data on glass markerboard, trim, and accessories.

**1.03 WARRANTY**

- A. See Section 017700 - Closeout, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 VISUAL DISPLAY UNITS**

- A. Porcelain Enamel Steel Markerboards:
  - 1. Manufacturers:
    - a. AJW Architectural Products; \_\_\_\_: [www.ajw.com/#sle](http://www.ajw.com/#sle).
    - b. ASI Visual Display Products; \_\_\_\_: [www.asi-visualdisplayproducts.com/#sle](http://www.asi-visualdisplayproducts.com/#sle).
    - c. Claridge Products and Equipment, Inc; \_\_\_\_: [www.claridgeproducts.com/#sle](http://www.claridgeproducts.com/#sle).
    - d. Nelson Adams NACO; \_\_\_\_: [www.nelsonadamsnaco.com/#sle](http://www.nelsonadamsnaco.com/#sle).
    - e. Substitutions: See Section 016000 - Product Requirements.
  - 2. Color: White.
  - 3. Size: As indicated on drawings.
  - 4. Accessories: Provide marker tray and map rail.

**2.02 MATERIALS**

- A. Fiber Board: ASTM C208, cellulosic fiber board.
- B. Adhesives: Type used by manufacturer.

**2.03 ACCESSORIES**

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
- B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- C. Mounting Brackets: Concealed.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

**3.02 PREPARATION**

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

**3.03 INSTALLATION**

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.



- C. Butt Joints: Install with tight hairline joints.
- D. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.
  - 1. Fabricate re-wrapped edges where partial panels abut each other, or adjacent surfaces or trim.
  - 2. Re-wrap top, bottom or side edges for cutting panels around door or window openings, abutting trim, protruding objects, and at other openings, including x-cut at receptacles, light switches, and other openings.
    - a. Wrap minimum 2 inches around back of panel.
    - b. Carefully cut fiber board, leaving covering intact. Wrap wallcovering tightly around edge of board and adhere continuously around back of panel with manufacturer's recommended adhesive.

#### **3.04 CLEANING**

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Final Acceptance.

**END OF SECTION**

**SECTION 102600  
WALL AND DOOR PROTECTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Corner guards.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, and anchorage details.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
  - 1. Submit two sections of corner guards, 24 inches long.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

**1.04 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures or internal connection failures.
    - b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Corner Guards:
  - 1. Products: As indicated on drawings.

**2.02 PERFORMANCE CRITERIA**

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

## **2.03 PRODUCT TYPES**

- A. Corner Guards - Surface Mounted:
  - 1. Corner guards fabricated from rolled section or bent plate are specified in Section 055000.
  - 2. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, thick.
  - 3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
  - 4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
  - 5. Width of Wings: As indicated on drawings.
  - 6. Corner: Square.
  - 7. Color: As indicated on drawings.
  - 8. Length: One piece.
  - 9. Preformed end caps.
- B. Adhesives and Primers: As recommended by manufacturer.
- C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.
- D. See Section 092116 for supports in stud wall construction.

## **2.04 FABRICATION**

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

## **2.05 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
- D. Start of installation constitutes acceptance of project conditions.

### **3.02 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position top of bumper rail at height indicated on drawings.
- C. Position top of corridor handrail at height indicated on drawings.
- D. Position corner guard above wall base to height indicated on drawings.
- E. Terminate rails 1 inch short of door openings and intersecting walls.
- F. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
  - 1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.

2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
4. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
5. Use a roller to ensure maximum contact with adhesive.
6. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

### **3.03 TOLERANCES**

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

### **3.04 CLEANING**

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

**END OF SECTION**

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**SECTION 104400  
FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, and color and finish.
- C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, and locations of individual fire extinguishers.

**1.03 FIELD CONDITIONS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.
- B. Fire Extinguishers:
  - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Kidde, a unit of United Technologies Corp: [www.kidde.com/#sle](http://www.kidde.com/#sle).
  - 3. Larsen's Manufacturing Co: [www.larsensmfg.com/#sle](http://www.larsensmfg.com/#sle).
  - 4. Potter-Roemer: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).
- C. Fire Extinguisher Cabinets and Accessories:
  - 1. Activar Construction Products Group, Inc. - JL Industries: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Kidde, a unit of United Technologies Corp: [www.kidde.com/#sle](http://www.kidde.com/#sle).
  - 3. Larsen's Manufacturing Co: [www.larsensmfg.com/#sle](http://www.larsensmfg.com/#sle).
  - 4. Potter-Roemer: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).

**2.02 FIRE EXTINGUISHERS**

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
  - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
  - 1. Locations: All fire extinguisher cabinets and brackets unless otherwise indicated.
  - 2. Class: A:B:C type.
  - 3. Size: 10 pound.
  - 4. Finish: Baked polyester powder coat, red color.
  - 5. Temperature range: Minus 40 degrees F to 120 degrees F.

### **2.03 FIRE EXTINGUISHER CABINETS, TYPE FEC1**

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
  - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- C. Fire Rated Cabinet Construction: Same as wall rating if indicated.
- D. Cabinet Configuration: Surface mounted type.
  - 1. Size to accommodate accessories.
  - 2. Trim: Flat square edge, with 1 1/2 inch wide face.
- E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.
- F. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
- G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- H. Fabrication: Weld, fill, and grind components smooth.
- I. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
- J. Finish of Cabinet Interior: White colored enamel.

### **2.04 ACCESSORIES**

- A. Extinguisher Brackets, Type FEB1: Formed steel, galvanized and enamel finished.
- B. Cabinet Signage: to match existing signage..
- C. Provide signage at all new and relocated cabinet locations.
- D. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

**END OF SECTION**

## **SECTION 110000 EQUIPMENT**

### **PART 1 GENERAL**

#### **1.01 ABBREVIATIONS AND ACRONYMS**

- A. OFOI - Owner Furnishes and Owner Installs.
- B. CFOI - Contractor Furnishes and Owner Installs.
- C. OFCI - Owner Furnishes and Contractor Installs.
- D. CFCI - Contractor Furnishes and Contractor Installs.

#### **1.02 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets of system components and accessories. Indicate dimensions, performance requirements, service requirements, materials, finishes, and options
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Package equipment to project site in protective packaging.
- B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.
- C. Store equipment and components from selective demolition for reinstallation. Protect stored items from damage during construction.

#### **1.04 WARRANTY**

- A. See Section 017700 - Closeout, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 ACCESSORIES**

- A. Installation Accessories: Provide necessary accessories and closure trim as required for complete installation.
- B. Fasteners: Manufacturer's standard inserts, anchors, bolts, rivets, and screws appropriate for project conditions; corrosion-resistant.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verification of Conditions: Examine areas and conditions, with installer present, for compliance with requirements of supporting structural members, installation tolerances, and other conditions that may impact performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install equipment in accordance with manufacturer's instructions and approved shop drawings.
- B. Set components plumb, level, and rigid.
- C. Install anchors in accordance with anchor manufacturer's installation guidelines.

**3.03 CLOSEOUT ACTIVITIES**

- A. Final Acceptance: Remove labels, fingerprints; clean surfaces. Repair any marred or damaged surfaces that effect appearance in manner not acceptable to Owner. Replace any parts that cannot be repaired in such a manner.

**3.04 PROTECTION**

- A. Protect installed equipment from subsequent construction operations.

**3.05 SCHEDULE**

- A. See drawings for Equipment Schedule.

**END OF SECTION**



**SECTION 115313  
LABORATORY FUME HOODS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Standard laboratory fume hoods.
- B. Fume hood base cabinets.
- C. Exhaust blowers.
- D. Work surfaces.
- E. Laboratory cup sinks in fume hoods.
- F. Service fittings and outlets.
- G. Airflow indicators and alarms.
- H. Piping within fume hoods for service fittings.
- I. Wiring within fume hoods for light fixtures and receptacles.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Provide fume hood exterior and interior dimensions and construction, utility and service requirements and locations.
- C. Shop Drawings: Indicate locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, locations and types of service fittings.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Provide documentation of successful Factory Acceptance Testing.
- E. Test Reports: Indicate that each type of fume hood has been factory-tested and meets specified ASHRAE Std 110 (AM) requirements.
- F. Operation Data: Include description of equipment operation and required adjusting and testing.
- G. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Project Record Documents: Record actual locations of concealed utility connections.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- C. Preconstruction Testing: Factory-test each type of hood as per referenced standard.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

### **1.06 WARRANTY**

- A. See Section 017700 - Closeout, for additional warranty requirements.
- B. Provide one year manufacturer warranty for manufacturer's standard items (listed by part number in manufacturer's official publication).

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Metal Laboratory Fume Hoods:
  - 1. Kewaunee Scientific Corp: [www.kewaunee.com/#sle](http://www.kewaunee.com/#sle).
  - 2. Mott Manufacturing Ltd: [www.mott.ca/#sle](http://www.mott.ca/#sle).
  - 3. Thermo Scientific Inc; [www.thermofisher.com/#sle](http://www.thermofisher.com/#sle)
  - 4. Labconco Corporation; [www.labconco.com/#sle](http://www.labconco.com/#sle)
- B. Provide laboratory fume hoods from single manufacturer.

### **2.02 CONSTANT AIR VOLUME (CAV) FUME HOODS**

- A. Bypass Fume Hoods:
  - 1. Include a built-in compensating bypass arrangement to maintain constant exhaust volume regardless of sash position.

### **2.03 PERFORMANCE REQUIREMENTS**

- A. Fume hoods complying with the following when tested in accordance with ASHRAE Std 110:
  - 1. As-Manufactured (AM) Rating: AM 0.01 (0.01 ppm).
  - 2. As-Installed (AI) Rating: AI 0.10 (0.10 ppm).
  - 3. Average Face Velocity: 100 FPM (0.51 m/s) plus or minus 10 percent with sashes fully open.
  - 4. Face-Velocity Variation: Not more than 10 percent of average face velocity across the face opening with sash(es) fully open.
  - 5. Release Rate: 4.0 L/min.
  - 6. Static-Pressure Loss: Not more than 1/2-inch w.g. (124 Pa) at 100 FPM (0.51 m/s) face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

### **2.04 FUME HOODS**

- A. General Requirements:
  - 1. Comply with SEFA 1.
    - a. Provide fume hoods UL listed and labeled for compliance with UL 1805.
  - 2. Pre-pipe fume hoods for service fittings.
  - 3. Pre-wire fume hoods for light fixtures and receptacles.
    - a. Terminate all wiring in a junction box on top of hood.
- B. Type FH , Fume Hood: Kewaunee, Supreme Air (BOD)
  - 1. Ventilation: Constant Air Volume (CAV).
  - 2. Configuration: Standing-height; bench mounted.
  - 3. Nominal Interior Height: As indicated on drawings.
  - 4. Sash Type: Vertical rising.
    - a. Leak-free enclosure box, manufacturer's standard construction, for vertical rising sash.

- b. Glazing: Laminated safety glass.
  - c. Sash Guides: Corrosion-resistant polyvinyl chloride (PVC) track.
  - d. Vertical Sash mechanism: Designed to prevent sash drop in case of mechanism failure.
    - 1) Cable: Minimum 3/32 inch (2 mm) thick stainless steel of construction standard with the manufacturer.
  - e. Vertical Sash Pull: Type 316 stainless steel, with No.4 finish.
  5. Top Front Panel: Standard integral grille stamped into panel of same materials as fume hood exterior.
  6. Exterior: Sheet steel.
  7. Interior Lining: Polypropylene.
    - a. Color/Finish: White.
  8. Service Fittings and Fixtures:
    - a. Cup Sink : Drop-in Polyolefin, complete with removable stainer and waste fitting.
      - 1) Shape: Oval.
      - 2) Size: 3 inches by 9 inches (75 by 228 mm).
    - b. Compressed Air Outlet Fitting Assembly: As indicated on drawings.
    - c. Vacuum Outlet Fitting Assembly: As indicated on drawings.
    - d. Water Outlet Fitting Assembly: As indicated on drawings.
    - e. Escutcheons: Stainless steel.
  9. Access Panels: Provide removable panels on both sides hood exterior and interior lining panels.
  10. Work Surface:
    - a. Work Top for Fume Hoods Other Than Floor-mounted Type: Epoxy resin.
      - 1) Edge: Raised rim with rounded edges and corners.
- C. Fume Hood Base Cabinets:
1. See Section 123553.13 - Metal Laboratory Casework.
  2. See Section 123553.19 - Wood Laboratory Casework.
- D. Light Fixtures: UL labeled, vaporproof, one-tube, T-5 fluorescent light fixtures. Number and length of fixtures as necessary for fume hood width. Mounted above sealed safety glass panel. White baked-enamel finish on fixture interior.
1. Average Interior Illumination Level: 80 footcandles.

## 2.05 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations, or as necessary to permit movement through a 35 inches by 79 inches clear door opening.
- B. Steel Exterior: Fabricated from steel sheet, 0.048 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Chemical-resistant finish applied to interior and exterior surfaces of component parts before assembly.
- C. Ends: Fabricated with double-wall end panels. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- D. Lining Assembly: Unless otherwise indicated, assembled with stainless-steel fasteners or epoxy adhesive, concealed where possible. Joints sealed by filling with chemical-resistant sealant during assembly.
  1. Lining components fastened together with stainless-steel cleats or angles to form a rigid assembly to which exterior panels are attached.

2. Punched fume hood lining side panels for service fittings and remote controls. Removable plug buttons for holes not used for indicated fittings.
- E. Rear Baffle: Same material as fume hood lining, unless otherwise indicated, at rear of hood with openings at top and bottom, with corrosion-resistant fasteners. Fabricated for removal to facilitate cleaning behind baffle.
  1. Preset baffles, unless otherwise indicated.
- F. Exhaust Plenum: Full width of fume hood, sized and configured to provide uniform airflow, of same material as hood lining, and with duct stub for exhaust connection.
  1. Duct-Stub Material: stainless steel, unless otherwise indicated.
- G. Airfoil: At bottom of fume hood face opening, with 1 inch gap between bottom of airfoil and work top. Sash to close on top of airfoil. Designed to direct airflow across work.
  1. Fabricated from 14 gauge, 0.0781 inch stainless steel with No.4 finish.
- H. Filler Strips: As needed to close spaces between fume hoods and/or fume hood base cabinets and adjacent building construction. Fabricated from same material and with same finish as fume hoods or fume hood base cabinets, as applicable. Flange, notch, and reinforce filler strips. Fabricate to form well-fitting closures, free from oil-canning.
- I. Ceiling Extensions: Filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods, and extending from tops of fume hoods to approximately 4 inches (102 mm) above ceiling. Flange, notch, and reinforce ceiling extensions as required for rigidity. Fabricate to form well-fitting closures, free from oil-canning.
  1. Provide bottom-hinged access panels within the front ceiling extension filler panel to facilitate access to light fixture and other fume hood components at top of hood not readily accessible by other means.
- J. Comply with requirements of other sections for factory installation of water and laboratory gas service fittings, piping, electrical devices, and wiring. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

## 2.06 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
- B. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces, and having a flame-spread index of 25 or less according to ASTM E84.
- D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.
  1. Physical Properties:
    - a. Flexural Strength: Not less than 10,000 pounds per square inch.
    - b. Modulus of Elasticity: Not less than 2,000,000 pounds per square inch.
    - c. Hardness (Rockwell M): Not less than 100.
    - d. Water Absorption (24 Hours): Not more than 0.02 percent.
    - e. Heat Distortion Point: Not less than 260 degrees F.
    - f. Flame-Spread Index: 25 or less according to ASTM E84.
  2. Chemical Resistance: As follows when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
    - a. No Effect:
      - 1) Acetic acid (98 percent).
      - 2) Acetone.
      - 3) Ammonium hydroxide (28 percent).

- 4) Benzene.
  - 5) Carbon tetrachloride.
  - 6) Dimethyl formamide.
  - 7) Ethyl acetate.
  - 8) Ethyl alcohol.
  - 9) Ethyl ether.
  - 10) Methyl alcohol.
  - 11) Nitric acid (70 percent).
  - 12) Phenol.
  - 13) Sulfuric acid (60 percent).
  - 14) Toluene.
- b. Slight Effect:
- 1) Chromic acid (60 percent).
  - 2) Sodium hydroxide (50 percent).
3. Color: Black.
- E. Polypropylene: Unreinforced polypropylene complying with ASTM D4101, Group 01, Class 1, Grade 2.
- F. Laminated Safety Glass: ASTM C1172.
- G. 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.
- H. Fasteners: Stainless-steel, where exposed to fumes.

## **2.07 ACCESSORIES**

- A. Airflow Monitors/Indicators and Alarms: Provide each fume hood with a airflow monitor/indicator complete with an audible and visual alarm that activates when airflow sensor reading is outside of preset range.
1. Source: Fume hood manufacturer.
    - a. AFA 1000 Alarm by TEL
    - b. TSI FHM-10-01 Fumehood Face Velocity Meter

## **2.08 EXHAUST BLOWERS**

- A. Dedicated exhaust blower at each fume hood indicated to be individually exhausted, of airflow capacity recommended by fume hood manufacturer.
1. Type: Direct drive.
  2. Materials: Epoxy-coated steel.
  3. Controls: On/Off using Fan switch located on fume hood post.
  4. Model selection coordinated with building electrical services.
  5. Model selection coordinated with expected static pressure losses in exhaust ductwork.

## **2.09 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory testing of each type of fume hood.
- C. Non-Complying Work: See Section 014000.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

- B. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- C. Comply with indicated requirements for installing water and laboratory gas service fittings, and electrical and telecommunications devices.
- D. Exhaust Blowers:
  - 1. Turn over to appropriate trade contractor(s) for installation.

### 3.03 FIELD QUALITY CONTROL

- A. Field test fume hoods as specified below.
  - 1. General: Test fume hoods as installed to assess airflow velocity. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for \_\_\_\_\_ hoods provided in the Project.
  - 2. Preparation:
    - a. Inspect each fume hood to confirm its installation complies with drawings and specifications.
    - b. Inspect laboratory space to verify that construction complies with drawings and specified requirements.
    - c. Do not proceed with fume hood testing until an acceptable TAB report has been received.
    - d. Verify that proper temperature and pressurization of the lab space can be maintained, with door(s) to the space in closed and open positions.
    - e. Adjust non-complying physical and control systems until conditions favorable to testing fume hoods are present.
  - 3. Operating Conditions Tests:
    - a. Conduct face velocity tests to confirm that target velocities are being achieved within acceptable tolerances.
    - b. Conduct airflow indicator/monitor tests to confirm acceptable variation from corresponding measured value. Calibrate and adjust device to function within specified accuracy parameters.
    - c. Conduct exhaust flow and static pressure tests of the HVAC system and its controls to confirm flow volume and static pressures are within acceptable tolerances.
    - d. Conduct tests of alarm device by shutting off the fume hood exhaust and verify that the individual fume hood alarm activates and operates in specified manner.
    - e. Conduct tests of individual controls provided at the fume hood (such as unoccupied cycle override, alarm override, etc.) to verify they operate in specified manner.
  - 4. Containment Performance Tests:
    - a. Conduct airflow visualization tests (local smoke challenges) to provide a visual indication of fume hood's capture performance.
      - 1) Coordinate disabling of local fire alarm system when performing this test.

- 2) Compensate for smoke discharge velocity and exposure outside of the fume hood.
- b. Conduct tracer gas containment tests, using mannequins to confirm gas concentrations meet (are below) specified criteria.
  - 1) Use tracer gas agreed-upon with Owner.
- B. Reporting Requirements: Comply with Section 5 of NEBB Fume Hood Testing (FHT) Standard, current edition. Organize and include, at a minimum, the following information:
  1. Report title.
  2. Report certification.
  3. Table of contents.
  4. Report summary/ remarks.
  5. Appropriate forms.
  6. Instrument calibration.
  7. List of abbreviations used.
  8. A room layout drawing for each tested item. Identify: walls; doors; fume hood(s); other present environmental enclosures (e.g. biological safety cabinet(s), laminar flow hood(s), canopy hood(s), etc.); location and airflow pattern of all air supply, return, and exhaust grilles, registers and diffusers.

#### **3.04 ADJUSTING**

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand only. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

#### **3.05 CLEANING**

- A. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

#### **3.06 DEMONSTRATION**

- A. Demonstrate proper operation of fume hoods and their accessories to Owner's designated representative.

**END OF SECTION**

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**SECTION 115314  
FUME EXTRACTORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fume extractors.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of fume extractors with laboratory casework and fume hoods and their exhaust systems.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination, for submittal procedures.
- B. Product Data: Fume extractor(s) dimensions and construction, utility and service requirements and locations, reach range diagrams, and \_\_\_\_\_.
- C. Shop Drawings: Indicate locations, large scale plans, elevations, cross sections, rough-in dimensions and tolerances, clearances required, locations and types of mounting accessories, and \_\_\_\_\_.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

**1.06 WARRANTY**

- A. See Section 017700 - Closeout, for additional warranty requirements.
- B. Provide two-year manufacturer warranty for manufacturer's standard items (listed by part number in manufacturer's official publication).

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Alsident System A/S; \_\_\_\_ [www.alsident.com/#sle](http://www.alsident.com/#sle).
- B. Nederman; \_\_\_\_ [www.nederman.com/#sle](http://www.nederman.com/#sle).
- C. Plymovent; \_\_\_\_ [www.plymovent.com/#sle](http://www.plymovent.com/#sle).
- D. Movex, Inc; [www.movexinc.com/#sle](http://www.movexinc.com/#sle).
- E. Substitutions: See Section 016000 - Product Requirements.

**2.02 MANUFACTURED UNITS**

- A. Basis of Design Manufacturer: Movex Terfu. MV2100-100.
- B. Fume Extraction Arms - General: Local exhaust ventilation device connected to facility air exhaust system.
  - 1. Extraction systems consisting of:
    - a. Multiple articulated rigid arms connected with rotating joints.
    - b. Fume collection hood.



- c. Mounting connectors and brackets.
- 2. System capable of 360 degrees rotation at joints, with a damper at one of the joints, and thumbscrews for fixing the angle of each arm.
- 3. Fume Extraction Arm:
  - a. Application: Common fumes, no requirements for anti-static or increased chemical resistance.
  - b. System Diameter: 3.93 inches.
  - c. Exhaust Capacity (Optimal Airflow Range): 115-265 CFM.
  - d. Maximum Noise: Noise at maximum airflow: 62 dB(A).
  - e. Maximum Fume Temperature: 158 degrees F.
  - f. Main System: Three-arms.
    - 1) Ceiling Connector: Manufacturer's standard, for ceiling, wall or bench mounting.
    - 2) Ceiling Connector Joint: White.
    - 3) Upper Arm: Aluminum tube.
    - 4) Middle Connector Joint: White.
    - 5) Lower Arm: Aluminum tube.
    - 6) Joint with Damper: White.
    - 7) Damper Handle: Manufacturer's standard (if provided).
    - 8) Collection Hood Arm: Aluminum tube.
    - 9) Collection Hood: Round, aluminum, with anodized finish.
      - (a) Size: Round, 13.3/4 inch diameter.
    - 10) Thumbscrews: Knurled head, diameter coordinated with hole in elbow.
  - g. Accessory components:
    - 1) Ceiling Mounting Bracket: Manufacturer's standard mounting bracket for attaching fume extraction assembly to structure.
    - 2) Ceiling Cover Plate: Manufacturer's standard cover plate for use at ceiling penetration opening for Extension Column/Arm.

## 2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 ASTM B221M.
- B. Polypropylene: ASTM D5857.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Locate framing that supports fume extractors above ceiling by field measurements before being concealed or enclosed, and indicate measurements on shop drawings.
- B. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume extractors.
- C. Coordinate locations with laboratory casework. Confirm installed fume extractor will allow opening doors, and access to contents, of adjacent wall (upper) cabinets.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and shop drawings.
- B. Interface With Other Work: Interface with installation of above-ceiling supports and/or bracing, ceilings, laboratory casework, and other types of laboratory ventilation equipment and systems.
- C. Systems Integration: Integrate fume extractors into overall exhaust system installation, including controls.

### **3.03 ADJUSTING**

- A. Adjust moving parts for smooth, near silent, operation with one hand.

### **3.04 CLEANING**

- A. Clean finished surfaces, touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

### **3.05 CLOSEOUT ACTIVITIES**

- A. Final Acceptance:
  - 1. Remove labels, fingerprints, and clean all surfaces both inside and out.
  - 2. Repair any marred or damaged surfaces that affect appearance, such as both interior and exterior of extractors in a manner acceptable to Owner.
  - 3. Replace any parts that cannot be repaired in such a manner.

### **3.06 PROTECTION**

- A. Protect installed local fume extractors from subsequent construction operations.

**END OF SECTION**

**SECTION 123553.13  
METAL LABORATORY CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Standard metal cabinets and cabinet hardware.
- B. Reagent shelving.
- C. Mobile cabinets.
- D. Tables.
- E. Wall shelving.
- F. Adaptable laboratory furniture system.
- G. Service enclosures.
- H. Acid storage cabinets.
- I. Solvent storage cabinets.
- J. Vacuum pump cabinets.
- K. Ceiling service panels.
- L. Countertops.
- M. Laboratory sinks.
- N. Drying Racks.
- O. Laboratory emergency equipment plumbing fixtures.
- P. Service fittings and outlets.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of casework with related items.
  - 1. Service Fixtures: Coordinate location and characteristics of service connections.
  - 2. Equipment and Instruments: Coordinate installation of casework with equipment and scientific instruments.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.03 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Details of materials, component dimensions and configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware and keying, accessories, and service fittings, if any.
- C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include coordinated information for laboratory equipment specified in another section and/or furnished by Owner.
- D. Samples For Color Selection: Color charts for each different finish material.
- E. Test Reports: Independent laboratory reports showing compliance with chemical and physical resistance requirements for casework finish.
- F. Maintenance Data: Manufacturer's recommendations for care and cleaning.

- G. Finish touch-up kit for each type and color of materials provided.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

#### **1.06 WARRANTY**

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year warranty against defects. Complete forms in Owner's name and register with manufacturer. Covered defects include, but are not limited to:
1. Ruptured, cracked, or stained finish coating.
  2. Discoloration, or lack of finish integrity.
  3. Cracking or peeling of finish.
  4. Weld or any other structural failure.
  5. Failure of hardware.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Metal Laboratory Casework:
1. Institutional Casework Inc; \_\_\_\_: [www.iciscientific.com/#sle](http://www.iciscientific.com/#sle).
  2. Kewaunee Scientific Corp; \_\_\_\_: [www.kewaunee.com/#sle](http://www.kewaunee.com/#sle).
  3. Mott Manufacturing Ltd; \_\_\_\_: [www.mott.ca/#sle](http://www.mott.ca/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Countertops:
1. Durcon (Epoxy resin); \_\_\_\_: [www.durcon.com/#sle](http://www.durcon.com/#sle).
  2. Symbiote Inc; Laboratory Countertops: [www.symbiote.com/#sle](http://www.symbiote.com/#sle).
  3. Kewaunee Scientific Corp (Epoxy resin); [www.kewaunee.com/#sle](http://www.kewaunee.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- C. Sinks and Cup Sinks:
1. Durcon (Epoxy resin, Polyolefin); \_\_\_\_: [www.durcon.com/#sle](http://www.durcon.com/#sle).
  2. Scientific Plastics, Inc. (Polyolefin); \_\_\_\_: [www.scientificplastics.com/#sle](http://www.scientificplastics.com/#sle).
  3. Simmon North America (Epoxy resin); <https://www.simmonsnorthamerica.com/#sle>.
  4. Kewaunee Scientific Corp; [\_\_\_\_]: [www.kewaunee.com/#sle](http://www.kewaunee.com/#sle).
  5. Substitutions: See Section 016000 - Product Requirements.
- D. Water and Gas Service Fittings:
1. Broen-Lab A/S; \_\_\_\_: [www.broen-lab.com/#sle](http://www.broen-lab.com/#sle).
  2. Chicago Faucets, a Geberit company; \_\_\_\_: [www.chicagofaucets.com/#sle](http://www.chicagofaucets.com/#sle).
  3. WaterSaver Faucet Co; \_\_\_\_: [www.wsflab.com/#sle](http://www.wsflab.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- E. Obtain casework from single source and manufacturer, unless otherwise indicated.

## 2.02 METAL LABORATORY CASEWORK

- A. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.
1. Style: Inset - square edge.
  2. Primary Cabinet Material: Cold-rolled steel.
  3. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions.
    - a. Base Cabinets: 22 inch.
    - b. Tall Cabinets: 22 inch.
    - c. Upper Cabinets: 14 inch.
  4. Steel Sheet Metal:
    - a. Gables, Front and Back Panels, Gusset Plates, Aprons, and Rails: 18 gauge, 0.0478 inch minimum thickness.
    - b. Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gauge, 0.0359 inch minimum thickness.
    - c. Backing Sheet to Door and Door Fronts: 22 gauge, 0.0299 inch minimum thickness.
  5. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7 and SEFA 8M, provide components that safely support the following minimum loads, without deformation or damage:
    - a. Base Units: 500 pounds per linear foot across the cabinet ends.
    - b. Tables: 300 pounds on four legs.
    - c. Drawers: 125 pounds.
    - d. Hanging Upper Cases: 300 pounds.
    - e. Shelves: 100 pounds.
  6. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
  7. Edges and Seams: Smooth. Form counter tops, shelves, and drain boards from continuous sheets.
  8. Shelf Edges: Turned down 3/4 inch on each side and returned 3/4 inch front and back.
  9. Ends: Close open ends with matching construction.
  10. Welding: Electric spot welded; joints ground smooth and flush.
  11. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
    - a. Fill with sound-deadening core.
  12. Shelves: Adjustable and fixed shelves formed down 3/4 inch, returned back 7/8 inch, and up 1/4 inch into a channel shape, front and rear; formed down 3/4 inch at each end. Shelves over 42 inches long reinforced with a channel welded to underside of shelf.
  13. Glazing: Type and thickness standard with manufacturer.
    - a. Framed Doors: Float glass, with gaskets and removable stops; minimize rattling and vibration.
  14. Fittings and Fixture Locations: Cut and drill countertops, backs, and other casework components for service outlets and fixtures.
  15. Removable back panels on all base cabinets. Partial height back panels at sink cabinets.
  16. Removable panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
    - a. Cutouts for power receptacles where indicated on drawings.
  17. Filler Panels: Flanged on both sides, of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

18. Scribe Panels: Similar to filler panels, except flanges on one side and flat on the other, of matching construction and finish.
  19. Stainless Steel Finish: No.4, brushed finish.
  20. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials, and to separate dissimilar metals.
- B. Reagent Shelving and Supports.
1. Shelves: As indicated on drawings.
  2. Supports: Manufacturer's standard metal support pedestal assemblies.
- C. Mobile Cabinets: Same construction as fixed base cabinets, with modifications.
1. Toe kick space eliminated.
    - a. Cabinet underside reinforced with 14 gauge, 0.0747 inch minimum steel channels to provide caster mounting points.
    - b. Four casters, each with a load rating of 165 pounds.
  2. For cabinets with drawers, include a counterweight to prevent the cabinet from tipping when one drawer is opened.
    - a. Drawers rated at 50 pounds, maximum.
- D. Acid Storage Cabinets: Construction identical to other cabinets, with following exceptions:
1. Completely lined with corrosion-resistant liner material; stainless steel fasteners for all connections and hardware inside cabinet.
  2. Shelves: Perforated or vented, rigid polypropylene.
  3. Bottom Pan: Liquid tight, polypropylene liner covering entire bottom of acid storage cabinet.
  4. Vents: Comply with SEFA 1.
    - a. Vent base cabinets through work surface behind baffle in hood with manufacturer's vent kit.
- E. Solvent (Flammable and Combustible Liquids) Storage Cabinets: Construction identical to other cabinets, with following exceptions:
1. Construct to NFPA 30 and applicable OSHA requirements.
  2. Comply with SEFA 11.
  3. Fire Resistance: Maximum internal temperature of 325 degrees F at the center, and 1 inch from top of the cabinet when cabinet is subjected to a ten minute fire test that simulates fire exposure of a standard time-temperature curve specified in ASTM E119.
  4. Steel sheet, 18 gauge, 0.0478 inch minimum thickness, double panel construction with 1-1/2 inch space between panels and electrical grounding connection.
  5. Shelves: Full depth, adjustable sloped metal shelf.
  6. Bottom Pan: 2 inches deep liquid-tight pan covering entire bottom of cabinet.
  7. Cabinet Hardware: UL-listed.
    - a. Self-closing Doors: Comply with requirements of NFPA 1 and ICC (IFC). Minimum 90 degree opening. Three-point latch arrangement, door(s) shutting and latching automatically when hold-open device's fusible link melts at 165 degrees F under fire conditions outside the cabinet. At pair of doors, synchronize latching so that both doors always fully close.
    - b. Grounding screw-lug.
  8. Signage: Provide manufacturer's standard signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.
- F. Vacuum Pump Cabinets: Construction identical to other cabinets, with following exceptions:
1. No cabinet bottom but with integral toe space, removable back panels, and precut 2-1/2 inch vent hole for separate vent assembly.

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2. Insulation: Manufacturer's standard acoustical insulation on interior of door panels, interior side of back and panels as well as underside of top panel.
  3. Motor Platform: Separate from cabinet, capable of supporting 300 pounds, two of four casters to be lockable, swivel-type; 2 inch lip and liquid tight pan covering entire bottom of cabinet.
  4. Pump On/Off Switch: Integral, 120V, 20A, with pilot light indicating availability of power and mode of vacuum pump operation.
    - a. Conduit Stub: 20 foot, 1/2 inch flexible metal conduit connected to switch, for connection to building power.
  5. Convenience Outlet: Integral electrical duplex outlet located in rear of cabinet, accessible from inside cabinet and pre-wired to pump on/off switch.
- G. Tables: Include adjustable height units.
1. Adjustable Height Table Construction: Manufacturer's standard, with countertop worksurfaces, unless noted otherwise.
    - a. Cantilevered Base Frame: Each base equipped with a pair of glides.
    - b. Worksurface Support Frame: Telescoping from base frame.
    - c. Worksurface: Manufacturer's standard material.
      - 1) Lift Capacity: 1,000 lb, evenly distributed on worksurface.
      - 2) Adjustability:
        - (a) Total Range: 14 inches.
        - (b) Manual Operation: Threaded fastener pins inserted into holes on 1 inch centers.
      - 3) Finish, Surface Color, and Texture: As indicated on drawings.
- H. Wall Shelving: At locations indicated.
1. Adjustable Shelf Supports: Standard back-mounted system using single-slotted surface mounted stainless steel shelf standards, in lengths indicated, with coordinated cantilevered shelf brackets, No.4 finish, designed for nominal 1 inch spacing adjustments.
  2. Shelves: Cold rolled steel; shelves in lengths indicated.
    - a. Depth: As indicated on drawings.
- I. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.
- J. Vertical Service Drop Enclosures: Where indicated on drawings, for service drops to metal casework.
1. Frames: Unless otherwise standard with the manufacturer, channel strut frames, with members at all corners, bottom, mid-height, and top of enclosure. Designed for anchorages at the bottom to countertop, and at top to miscellaneous metal support framing.
  2. Enclosures: Consisting of fixed and removable (access) panels, in configuration standard with the manufacturer.
    - a. Extent: Up to underside of ceiling.
    - b. Rear Panel: Fixed panel, constructed like other casework closure panels.
    - c. Side Panels: Fixed panels, constructed like other casework closure panels.
    - d. Front Panels:
      - 1) Fixed Panel: Metal panel, constructed like other casework closure panels.
      - 2) Removable (Access) Panel: Metal panel, constructed like other casework closure panels.
    - e. Attachment: Use corrosion-resistant metal mounting hardware and fasteners.

- K. Ceiling Service Panels: Designed to integrate into acoustical panel suspension grids for delivering multiple plumbing, electrical and data services.
1. Fabricated to fit in standard 24 inches by 24 inches ceiling grids.
  2. Enclosure Material: 18 gauge sheet steel with chemical-resistant finish specified herein.
  3. Required Fitting Types: Quick-connect fittings and hoses.
  4. Service Panel Types: Pre-punched panels accepting groups of services.
  5. Quick-Connect Fittings: Male and female types, suitable for service connected, 3/8 inch NPS.
  6. Accessories:
    - a. Service Hoses.
      - 1) Reinforced PVC Hoses: Provide for non-burning gases, 3/8 inch NPS female inlet and 3/8 inch NPS male outlet. 48 inch length.
      - 2) Coiled Polyurethane Hoses: Provide for non-burning gases, 3/8 inch NPS female inlet and 3/8 inch NPS male outlet. 48 inch length.
    - b. Power Cords.
      - 1) Single-circuit, 3-wire, 20 AMP/120 VAC, 48 inches long, with Standard Blade plugs.

### **2.03 ADAPTABLE LABORATORY FURNITURE SYSTEM**

- A. General: Modular component system incorporating and/or accommodating compatible metal laboratory casework items, including: cabinets, countertop frames, ledges and supporting structures.
- B. SEFA System Classification: Class 7 - Free-standing workstation.
- C. Structural Modules: Primary support structures for adjustable work surfaces, shelving, utility delivery systems, and casework. Slotted channel design to provide support for components on 1 inch vertical increments.
1. Module Length(s): As indicated on drawings.
  2. Module Height(s): As indicated on drawings.
  3. Anchors and Brackets: For each structural support island, peninsula, and corner module; providing specified load-bearing capacity for the module, and resulting in a rigid, non-racking system. Height of module to permit anchorage to supplementary structural bracing above ceiling.
    - a. At Top: Mounting brackets or clip angles standard with the system manufacturer.
  4. Island and Peninsula Modules Accessories:
    - a. Electrical/Telecommunications Vertical Raceways: Single, for end support module, with inside facing receptacle cutouts. Full height between counter level and top panel of structural module.
- D. Facing Panels: End and insert closure panels at locations indicated on drawings.
1. Modular units, with tight fit to other system components. Panels to be removable and replaceable without use of special tools.
  2. Unless otherwise indicated, facing closure panels of the following types:
- E. Worksurface Frames and Countertops:
1. Core-based Frames: Shaped to allow cantilevering from structural modules and capable of supporting the weights of the countertop, suspended base cabinets, and imposed loads.
    - a. Frame Length(s): As indicated on drawings.
    - b. Total Supportable Load: 600 pounds, maximum, per frame.
    - c. Provide channels for suspension of base cabinets at any point along their length.
  2. Countertops: Include type(s) specified below.



- a. Material: Countertops made from epoxy resin.
- b. Cantilevered Countertop Front-to-back Dimension: 30 inches.
- F. Shelving: Modular units with integral brackets formed from metal sheets, with additional stiffener/reinforcing for units over 48 inch long.
- G. Finishes:
  - 1. Metal components: Same as other casework specified in this section.

## 2.04 CABINET HARDWARE

- A. Manufacturer's standard styles, and as indicated below.
- B. Finish of exposed stainless steel components: No.4 finish.
- C. Locks: On casework drawers and doors, where indicated. Lock with 5 pin cylinder and 2 keys per lock.
  - 1. Keying: Key locks alike within a space; key each room separately.
- D. Shelves in Cabinets:
  - 1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- E. Swinging Doors:
  - 1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.
    - a. Butt Hinges for Inset Doors: five-knuckle, projecting barrel, minimum 2-1/2 inches long. Stainless steel with No.4 finish.
  - 2. Catches: Magnetic.
  - 3. Pulls: Stainless steel wire pulls, 4 inches wide.
- F. Sliding Doors:
  - 1. Pulls: Steel, recessed circular design.
    - a. Steel Finish: Bright chromium plated over nickel on base material.
  - 2. Track Assembly: Nylon track with solid bearing followers.
- G. Drawers:
  - 1. Pulls: Stainless steel wire pulls, 4 inches wide.
  - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

## 2.05 COUNTERTOPS

- A. Countertops:
  - 1. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
    - a. Flat Surface Thickness: 1 inch, nominal.
    - b. Surface Finish: Smooth, non-glare.
    - c. Color: Black.
    - d. Exposed Edge Shape: 1/8 inch bevel chamfer.
    - e. Drip Edge: Drip groove 1/8 inch wide and deep, located 1/2 inch back from edge on underside of each exposed edge.
    - f. Back and End Splashes: Same material, same thickness; separate for field attachment.

## 2.06 SINKS

- A. Laboratory sinks.
  - 1. General: Sinks with perimeter lip for drop-in installation.

2. Sink types and sizes are indicated on drawings.
3. Splash Guards: Provide guards made of clear acrylic sheet set into aluminum channel adjacent to sink areas. See drawings for locations and configurations required.

## 2.07 DRYING RACKS

- A. Epoxy drying racks with pre-drilled or punched holes in a staggered pattern, designed to accept removable white polypropylene pegs. With each pegboard include a stainless steel drip-trough with drain outlet and matching diameter 36 inch long PVC drain hose.
  1. Size: 24 inches wide by 30 inches high.

## 2.08 LABORATORY EMERGENCY EQUIPMENT PLUMBING FIXTURES

- A. General: Provide emergency equipment products complying with requirements of ANSI Z358.1.
- B. Eyewash/Safety Shower Combination Units: Surface mounted or recessed into wall construction.
  1. Cover/Eyewash Drain Pan: Combination fixture, with projecting activation handle requiring grasping and pulling down into operating position for activation.
    - a. Plug-type valve designed to open orifice and activate water flow only when unit is swung down into operational position
    - b. Twin eyewash heads mounted on supply arms, with internal flow control, and filter.
  2. Shower Head: 10 inch diameter stainless steel, with 20 gallons per minute flow control.
    - a. Mounting: Below finished ceiling. Include vertical supply pipe and ceiling escutcheon.
    - b. Offset Dimension from Wall to Centerline of Head: 36 inches, barrier-free.
  3. Cabinet: Designed for recess into 3-5/8 inch minimum depth metal-framed wall construction.
    - a. Mounting: Mount at height complying with ADA Standards.
  4. Activation Handle: Recessed into cabinet, projecting 1-7/8 inches maximum beyond face of wall, and requiring pushing down for activation.
    - a. Grip: Manufacturer's standard vinyl grip.
  5. Water Supply: 1 inch NPS FPT; 35 psi, minimum pressure.
  6. Drain Outlet: 2 inch NPS FPT.
  7. Manufacturers:
    - a. WaterSaver Faucet Co; \_\_\_\_\_: [www.wsflab.com/#sle..](http://www.wsflab.com/#sle..)
    - b. Guardian Equipment; <https://www.gesafety.com/#sle>.
    - c. Substitutions: See Section 016000 - Product Requirements.

## 2.09 SERVICE FITTINGS

- A. General: Comply with requirements of SEFA 7.
- B. Gas Service Fittings and Fixtures.
  1. As indicated on drawings.

## 2.10 MATERIALS

- A. Sheet Steel: High-strength low-alloy, cold rolled and leveled unfinished steel sheet, ASTM A1008/A1008M, Class 1 (matte) finish.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Solid Epoxy Resin: Modified epoxy resin and non-asbestos inert fillers cast into sheets.
- D. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 3/16 inch thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.

- E. Solvent-Resistant Liner Material: High density, asbestos free, non-combustible, calcium-silicate-based panel consisting of autoclaved Portland cement, mineral fillers and synthetic fibers.
- F. Sealant For Use in Casework Installation:
  - 1. One component, clear silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

### 2.11 FINISHES

- A. Sheet Steel Finish: Having chemical resistance equal to Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8M. Test applied finishes using procedures specified in ASTM D522/D522M.
  - 1. Coating Type, New Casework: Baked on epoxy; minimum two coats.
  - 2. Color: As selected from manufacturer's standard selection.
  - 3. Preparation: Degrease and phosphate etch, and prime.

### 2.12 ACCESSORIES

- A. Gas Cylinder Brackets: Restraint safety assemblies for laboratory gas cylinders.
  - 1. Regulatory Compliance: OSHA and NFPA.
  - 2. Bracket Mounting: Wall, with fasteners.
  - 3. Cylinder Capacity: Two
  - 4. Cylinder Diameter Capability: 4 to 12 inches.
  - 5. Bracket Construction: 11 gauge, 0.119 inch hot-rolled steel.
    - a. Metal Bracket Edge Protection: Steel-reinforced vinyl edge guard.
  - 6. Steel Finish: Polyester powder-coat.
- B. Coat Hooks
  - 1. Manufacturers:
    - a. Bradley Corporation (Basis of Design)
    - b. Bobrick Washroom Equipment, Inc.
    - c. G2 Gownrite
  - 2. Construction:
    - a. Blackplate; 22 gauge stainless steel in satin finish
    - b. Hooks; 14 gauge stainless steel
- C. Tool Pegboard

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify adequacy of support framing and anchors.
- B. Verify that service connections are correctly located and of proper characteristics.

### 3.02 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure, with no distortion.

1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
  - D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
  - E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
    1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
    2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet .
    3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
    4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
    5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
  - F. Secure upper and floor cabinets to concealed reinforcement at gypsum board assemblies.
  - G. Separate dissimilar metals to prevent galvanic action.
  - H. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
  - I. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
  - J. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
  - K. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
    1. Install vent kits and connect to exhaust system.
    2. Use only rigid materials for venting. No flexible materials permitted.
  - L. Replace units that are damaged, including those that have damaged finishes.
  - M. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.
  - N. Deliver sinks, cup sinks, and service fittings in properly marked boxes, accompanied with written instructions, for supervised installation by appropriate trade contractor(s).

### **3.03 ADJUSTING**

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

### **3.04 CLEANING**

- A. Clean casework and other installed surfaces thoroughly.

### **3.05 PROTECTION**

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.
- C. Repair damage that occurs prior to Date of Final Acceptance, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

**END OF SECTION**

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**SECTION 123553.19**  
**WOOD LABORATORY CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Standard wood cabinets and cabinet hardware.
- B. Mobile cabinets.
- C. Tables.
- D. Wall shelving.
- E. Acid storage cabinets.
- F. Solvent storage cabinets.

**1.02 DEFINITIONS**

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate installation of casework with related items.
  - 1. Service Fixtures: Coordinate location and characteristics of service connections.
  - 2. Equipment and Instruments: Coordinate installation of casework with equipment and scientific instruments.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.04 SUBMITTALS**

- A. See Section 013100 - Project Management and Coordination for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include coordinated information for laboratory equipment specified in another section and/or furnished by Owner.
- D. Samples For Color Selection: Wood samples, fully finished, for color and species selection. Minimum Sample Size: 2 inches by 3 inches.
- E. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for cabinet finish and liner materials.
- F. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- G. Finish touch-up kit for each type and color of materials provided.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
  - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
  - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" paragraph of this section.

### 1.07 WARRANTY

- A. See Section 017700 - Closeout for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Final Acceptance, at no additional cost to Owner. Defects include, but are not limited to:
  - 1. Ruptured, cracked, or stained finish coating.
  - 2. Discoloration, or lack of finish integrity.
  - 3. Cracking or peeling of finish.
  - 4. Failure of hardware.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Wood Laboratory Casework:
  - 1. Institutional Casework Inc; \_\_\_\_: [www.iciscientific.com/#sle](http://www.iciscientific.com/#sle).
  - 2. Kewaunee Scientific Corp; \_\_\_\_: [www.kewaunee.com/#sle](http://www.kewaunee.com/#sle).
  - 3. Mott Manufacturing; \_\_\_\_: [www.mott.ca/#sle](http://www.mott.ca/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.

### 2.02 WOOD LABORATORY CASEWORK

- A. Wood Laboratory Casework is part of a Laboratory Casework System, see Section 123553.13.
- B. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
  - 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
  - 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
    - a. Base Cabinets: 22 inches.
    - b. Tall Cabinets: 22 inches.

- c. Upper Cabinets: 14 inches.
  3. Construction: Joints doweled, glued and screwed, except drawers may be lock-shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
  4. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7, and SEFA 8W, components safely support the following minimum loads:
    - a. Base Units: 500 pounds per linear foot across the cabinet ends.
    - b. Tables: 300 pounds, minimum, on four legs.
    - c. Drawers: 125 pounds, minimum.
    - d. Hanging Wall Cases: 300 pounds.
    - e. Shelves: 100 pounds, minimum.
  5. Glazing: Type and thickness standard with manufacturer.
    - a. Framed Doors: Float glass, with gaskets and removable stops; minimize rattling and vibration.
  6. Fittings and Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
  7. Removable back panels on base cabinets. Provide partial height back panels at sink cabinets.
  8. Removable panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
    - a. Cutouts for power receptacles where indicated on drawings.
  9. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
  10. Factory-finish all exposed and semi-exposed surfaces with the same finish.
    - a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
      - 1) Hot water at temperature between 190 degrees F and 205 degrees F trickled down the test surface at 45 degree angle for 5 minutes.
      - 2) Constant moisture in the form of 2 by 3 by 1 inch thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
    - b. Preparation: Wood sanded smooth, free from dust and mill marks.
    - c. Stain: Single application of clean, manufacturer-recommended stain of selected color; tinted coating not acceptable.
    - d. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
    - e. Coats: Multiple coats as required to achieve minimum 1.5 mil dry film thickness.
    - f. Appearance: Clear satin gloss; not cloudy or muddy.
- C. Mobile Cabinets: Same construction as fixed base cabinets, with modifications.
  1. Toe kick space eliminated.
  2. Cabinet underside reinforced as is standard with the manufacturer to provide caster mounting points.
  3. Four casters, each with a load rating of 165 pounds.
  4. For cabinets with drawers, include a counterweight to prevent the cabinet from tipping when one drawer is opened.
    - a. Rate drawers at 50 pounds maximum.
- D. Acid Storage Cabinets: Construction identical to other cabinets, with following exceptions:
  1. Completely lined with corrosion-resistant liner material; stainless steel fasteners for all connections and hardware inside cabinets.

2. Shelves: Removable, same material as cabinet, covered with corrosion-resistant liner.
3. Bottom Pan: Liquid-tight liner covering entire bottom of acid-storage cabinet.
4. Vents: Comply with SEFA 1.
  - a. Vent base cabinets through work surface behind baffle with manufacturer's vent kit.
- E. Solvent (Flammable and Combustible Liquids) Storage Cabinets: Construction identical to other cabinets, with following exceptions:
  1. Construct to NFPA 30 and applicable OSHA requirements.
  2. Comply with SEFA 11.
  3. Fire Resistance: Maximum internal temperature of 325 degrees F at the center, and 1 inch from top of the cabinet when cabinet is subjected to a ten minute fire test that simulates fire exposure of a standard time-temperature curve specified in ASTM E119.
  4. Shelves: Full depth, adjustable.
  5. Bottom Pan: 2 inches deep, liquid-tight pan covering entire bottom of cabinet.
  6. Cabinet Hardware: UL-listed.
    - a. Hinges: Full-length stainless steel continuous (piano) hinges.
    - b. Self-closing Doors: Comply with requirements of NFPA 1 and ICC (IFC). Minimum 90 degree opening. Three-point latch arrangement, door(s) shutting and latching automatically when hold-open device's fusible link melts at 165 degrees F under fire conditions outside the cabinet. At pair of doors, synchronize latching so that both doors always fully close.
    - c. Door Handles: Manufacturer's standard, with slip-resistant grip.
  7. Signage: Provide manufacturer's standard signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.
- F. Tables: With standard aprons manufactured of not less than 3/4 by 3 1/2 inch solid lumber, machined to receive corner blocks, and bolted to 2 1/8 by 2 1/8 inch solid hardwood legs. 3/8 inch leveling devices, and slip-on type black PVC shoes.
- G. Wall Shelving: At locations indicated.
  1. Adjustable Shelf Supports: Standard back-mounted system using single-slotted surface mounted stainless steel shelf standards, in lengths indicated, with coordinated cantilevered shelf brackets, no.4 finish, designed for nominal 1 inch spacing adjustments.

### 2.03 CABINET HARDWARE

- A. Manufacturer's standard types, styles, and finishes.
- B. Comply with BHMA A156.9 requirements.
- C. Finish of exposed stainless steel components: No.4 finish.
- D. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
  1. Keying: Key locks alike within a space; key each room separately.
- E. Shelves in Cabinets:
  1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- F. Swinging Doors:
  1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.
    - a. Butt Hinges for Inset Doors: five-knuckle, projecting barrel, minimum 2-1/2 inches long. Stainless steel with No. 4 finish.
  2. Catches: Magnetic.
  3. Pulls: Chrome wire pulls, 4 inches wide.



4. Sliding Doors:
  - a. Pulls: Steel, recessed circular design.
    - 1) Steel Finish: Bright chromium plated over nickel on base material.
  - b. Track Assembly: Nylon track with solid bearing followers.
5. Drawers:
  - a. Pulls: Chrome wire pulls, 4 inches wide.
  - b. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

## 2.04 MATERIALS

- A. Wood-Based Materials:
  1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
  2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.
- B. Exposed Solid Wood: Clear, dry, sound, plain sawn, selected for compatible grain and color, no defects.
- C. Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade AA, Type I; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.
- D. Semi-Exposed Solid Wood: Dry, sound, plain sawn, no appearance defects, any species similar in color and grain to exposed portions.
- E. Semi-Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade C, Type I; plain sliced, any species similar in color and grain to exposed portions.
- F. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.
- G. Hardboard: ANSI A135.4, Class 1, tempered.
- H. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 3/16 inch thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.
- I. Solvent-Resistant Liner Material: High-density, asbestos-free, non-combustible, calcium-silicate-based panel consisting of autoclaved Portland cement, mineral fillers and synthetic fibers.
- J. Solvent-Resistant Liner Material: Polypropylene.
- K. Sealant for Use in Casework Installation:
  1. One component, clear silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Site Verification of Environmental Conditions:
  1. Do not deliver casework until the following conditions have been met:
    - a. Building has been enclosed (windows and doors sealed and weather-tight).
    - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
    - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
    - d. Installation areas do not require further "wet work" construction.

- B. Verify adequacy of support framing and anchors.
- C. Verify that service connections are correctly located and of proper characteristics.

### **3.02 INSTALLATION**

- A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
  - 1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
  - 2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
  - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
  - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
  - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
  - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
  - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Secure upper and floor cabinets to concealed reinforcement at gypsum board assemblies.
- G. Separate dissimilar metals to prevent galvanic action.
- H. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- I. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- J. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- K. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
  - 1. Install vent kits and connect to fume hood exhaust system.
  - 2. Use only rigid materials for venting. No flexible materials permitted.
- L. Coordinate installation of work of this section with installation of fume hoods and laboratory equipment.
- M. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.
- N. Replace units that are damaged, including those that have damaged finishes.

### **3.03 ADJUSTING**

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

**3.04 CLEANING**

- A. Clean casework and other installed surfaces thoroughly.

**3.05 PROTECTION**

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.
- C. Repair damage that occurs prior to Date of Final Acceptance, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

**END OF SECTION**

**SECTION 21 0501**  
**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Drawings and general provisions of the contract documents including General and Supplementary Conditions and Division 00 and 01 Specification sections apply to all work in this section.
- B. The General Conditions shall be carefully examined before proposals for any work are submitted. Division 21 shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions unless Division 21 specifications contain statements more definitive or more restrictive.
- C. Nothing herein contained shall be so construed to relieve the Contractor from doing his work according to the true intent and meaning of these drawings and specifications. He will be held to provide and install all materials and equipment and shall furnish all labor necessary for the complete, prompt, and satisfactory execution of the work. He is also responsible for the proper coordination of his work with all other trades.
- D. The Contractor shall bear all expenses incidental to the satisfactory completion of the work contained in these specifications and drawings.

**1.2 SCOPE**

- A. Perform work and provide material and equipment as shown on Drawings and/or as specified and/or indicated in this Section of the Specifications. Completely coordinate work of Divisions 21 with work of other trades and provide a complete and fully functional installation.
- B. Drawings and Specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices, and materials obviously necessary for a sound, secure and complete installation.
- C. It is the intent that these Specifications and Drawings are to establish minimum requirements for methods, products, and equipment and to provide electrical service, distribution and systems finished, tested and ready for operation. Incidental detail not usually shown or specified, but necessary for proper installation and operation shall be included in the work and this Contractor's estimate, the same as if specified. Locations of all equipment and material shall be adjusted at no extra cost to the Owner, to accommodate the work interferences anticipated and/or encountered. Prior to installation, determine the exact route and location of each raceway and piece of equipment to minimize conflicts with other trades.
- D. Give notices, file plans, obtain permits and licenses, pay fees and back-charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
- E. Division 21 Contractor shall furnish all motor starters and disconnect switches as required by NEC for motors, unless specifically noted otherwise in the specifications or on the drawings. Motor starters and disconnect switches shall be in accordance with Division 26 Specifications.
- F. If a Guaranteed Maximum Price (GMP) has been prepared using documents prior to the issuance of the ISSUED FOR CONSTRUCTION, the Contractor shall identify any and all changes to the documents (both drawings and specifications) that are affecting the GMP, either increasing or decreasing the GMP amount. All changes shall be numbered and circled, in both drawings and specifications. The Contractor shall also provide detailed cost back-up for all items noted above.

- G. Work consists of furnishing all labor, material, equipment, and services necessary and reasonably incidental to the proper completion and proper operation of the fire protection systems. The work shall consist of but shall not necessarily be limited to the following:
1. Automatic wet pipe sprinkler systems in the buildings as indicated, including hydraulic calculations.
  2. Wet pipe automatic sprinkler systems as specified in Section 21 2313.
  3. Fire-Suppression Standpipes as specified in Section 21 2319.
  4. Fire Pump system as specified in Section 21 3001.
  5. Piping materials and installation instructions common to most piping systems.
  6. Mechanical sleeve seals.
  7. Sleeves.
  8. Escutcheons.
  9. Grout.
- H. The General Conditions shall be carefully examined before proposals for any work are submitted. Division 21 shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions unless Division 21 specifications contain statements more definitive or more restrictive.
- I. Nothing herein shall be so construed to relieve the Contractor from doing his work according to the true intent and meaning of the drawings and specifications. He will be held to provide and install all materials and equipment, and shall furnish all labor necessary for the complete, prompt, and satisfactory execution of the work. Also, he is responsible for properly coordinating his work with all other trades.
- J. The contractor shall bear all expenses incidental to the satisfactory completion of the work contained in these specifications and drawings.
- K. The Contractor shall coordinate water service requirements in accordance with the local water utility regulations, including required permits, backflow preventers, meters, piping, valves, bypasses, supports and other accessories.
- L. The contractor shall perform a two-hydrant flow test on the portion of the public water system serving the project site. This flow test shall conform to the requirements defined in NFPA 13 and shall identify the location of the tested hydrants and their relationship to the location of the water supply tap. The elevation of the test hydrants as it related to the Project shall be included. The time of day of the test shall also be recorded. This test shall be coordinated with and conform to the requirements of the local authority having jurisdiction. This flow test shall be used as the hydraulic basis for all fire protection systems included in the Project. The flow test shall be made prior to the development of sprinkler system shop drawings and system hydraulic calculations. All cost associated with the flow test shall be paid by the contractor. The flow test shall be submitted to the Architect and Engineer within ninety (90) days of notice to proceed.
- M. The Contractor shall affix the seal of the registered professional engineer or the NICET Level III designer to all submitted system drawings and hydraulic calculations as required by the State of North Carolina General Statutes.
- N. Related Sections:
1. Division 03 - Concrete Forming and Accessories.
  2. Division 09 - Painting and Coating.

### **1.3 DEFINITIONS AS USED IN THESE SPECIFICATIONS**

- A. "Provide," means "furnish and install".

- B. "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support".
- C. "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
- D. "Architect" means the "Prime Design Consultant," and if United Engineering Group, Inc. is not the prime design consultant, the Architect may authorize United Engineering Group to act on the Architect's behalf in matters concerning the Division 21 series of specifications.
- E. "RFI" means Contractor's "Request for Information".
- F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- G. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- H. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- I. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- J. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- K. The following are industry abbreviations for plastic materials:
  - 1. Retain abbreviations that remain after this Section has been edited.
  - 2. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 3. CPVC: Chlorinated polyvinyl chloride plastic.
  - 4. PE: Polyethylene plastic.
  - 5. PVC: Polyvinyl chloride plastic.
- L. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### **1.4 CONTRACT DOCUMENTS**

- A. Listing of Drawings does not limit responsibility of determining full extent of work required by these Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, Site Utility and all other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of Division 21 must be coordinated.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the

approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

- E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.
- F. Data that may be furnished electronically by the Architect (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Architect's sealed or stamped construction documents.

### **1.5 DISCREPANCIES IN DOCUMENTS**

- A. Where Drawings or Specifications conflict or are ambiguous, the contractor shall advise the Architect in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Architect in writing before installation. Otherwise, make changes in installed work as Architect requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specifications, this contractor shall provide that material, installation, or work which is of the higher, more stringent standard.
- D. It is a requirement of these Contract Documents to have the contractor provide systems and components that are fully complete, operational, and suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component or its coordination with other building elements. In cases such as this, where the Contractor has failed to notify the Architect of the situation in accordance with Paragraph (A) above, the Contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by Paragraph (D) above, where the Contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Architect shall review and advise the contractor of the disposition.

### **1.6 MODIFICATIONS IN LAYOUT**

- A. Fire Protection Drawings are diagrammatic. They indicate general arrangements of fire suppression systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. In order to obtain the Architect's desired aesthetics in spaces used by building occupants, in all such spaces, prior to installation of visible material and equipment (including access panels) review Architectural Drawings for desired locations and where not definitely indicated, request information from Architect.
- C. Check Contract Documents, as well as Submittals and Shop Drawings of all subcontractors to verify and coordinate spaces in which work of Divisions 21 will be installed.
- D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C and D above. Systems shall be run in a rectilinear fashion.

- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

### **1.7 REQUESTS FOR INFORMATION (RFIs)**

- A. If the RFI is a request to resolve a conflict or an ambiguity, or a request for additional detail, Contractor's RFI shall include a sketch or equivalent description of Contractor's proposed solution, in accordance with paragraphs 1.5 (E) and 1.6 (F) above.
- B. To expedite the flow of RFI's, for all RFI's under Divisions 21, Contractor shall submit the attached form, or similar form including the same information, to the Architect, with copy to United Engineering Group. Contractor shall include proposed solution in the indicated space on the form.

### **1.8 REFERENCES**

- A. The Contractor shall comply with all laws, ordinances, and regulations of all authorities having jurisdiction, including those of all applicable city, county, state, federal and public utility entities. The Contractor shall obtain all licenses, permits, etc. and shall pay all associated connection fees, tapping fees, inspection fees, etc. This cost shall be included in the contract price.
- B. The publications listed below form a part of this specification. All publications shall be the latest edition as adopted by the authority having jurisdiction. The publications are referred to in the text as necessary. The minimum standard of work under this contract shall be in accordance with the following model building codes and standards.
1. North Carolina State Building Codes:
    - a. Building Code – 2012 edition.
    - b. Fire Prevention Code – 2012 edition.
  2. National Fire Protection Association:
    - a. NFPA 13 - Standard for the Installation of Sprinkler Systems. 2013.
    - b. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems, 2013.
    - c. NFPA 20 - Standard for the Installation of Centrifugal Fire Pumps, 2013.
    - d. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2013.
    - e. NFPA 70 - National Electrical Code.
  3. North Carolina Department of Insurance:
    - a. Requirements for Automatic Sprinkler Systems.
  4. American Bearing Manufacturers Association:
    - a. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
  5. Air Movement and Control Association International, Inc.:
    - a. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
  6. American National Standards Institute (ANSI):
    - a. ANSI A21.4 / AWWA C104 – Cement Mortar Lining for Ductile-Iron Pipe.
    - b. ANSI A21.11 / AWWA C111 – Rubber Gasket Joints for Ductile-Iron Pipe.
    - c. ANSI A21.51 / AWWA C151 – Ductile-Iron Pipe.
    - d. ANSI B16.4 – Cast Iron Screwed Fittings.
    - e. ANSI B16.12 – Cast Iron Drainage Fittings, Threaded.
    - f. ANSI B16.15 – Pipe Fittings, Bronze, and 250 lb. Cast.
    - g. ANSI B16.18 – Cast Copper Allow Solder-Joint Pressure Fittings.



- h. ANSI B16.22 – Solder-Joint Fittings, Pressure Wrought Copper and Copper Alloy.
  - i. ANSI B16.23 – Cast Copper Alloy Solder-Joint Drainage Fittings.
  - j. ANSI B16.24 – Bronze Pipe Flanges and Flanged Fittings.
  - k. ANSI B16.29 - Solder-joint fittings, Drainage, DWV Wrought Copper and Copper Alloy.
  - l. ANSI S1.4 - Sound Level Meters.
  - m. ANSI S1.8 - Reference Quantities for Acoustical Levels.
  - n. ANSI S1.13 - Methods for the Measurement of Sound Pressure Levels in Air.
  - o. ANSI S12.36 - Survey Methods for the Determination of Sound Power Levels of Noise Sources.
7. Air-Conditioning and Refrigeration Institute:
- a. ARI 575 - Method of Measuring Machinery Sound within Equipment Space.
8. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
- a. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
  - b. ASHRAE Handbook - HVAC Applications.
9. American Society of Mechanical Engineers (ASME):
- a. ASME A13.1 - Scheme for the Identification of Piping Systems.
  - b. ASME B31.9 - Building Services Piping.
  - c. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
  - d. ASME B16.11 - Forged Steel Fittings - Socket-Welding and Threaded.
  - e. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - f. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - g. ASME B16.25 – Butt-welding Ends.
  - h. ASME B16.3 - Malleable Iron Threaded Fittings.
  - i. ASME B16.4 - Gray Iron Threaded Fittings.
  - j. ASME B16.5 - Pipe Flanges and Flanged Fittings.
  - k. ASME B16.9 - Factory-Made Wrought Steel Butt-welding Fittings.
  - l. ASME B31.1 - Power Piping.
  - m. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
  - n. ASME B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.
  - o. ASME - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels.
  - p. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
10. American Society of Testing and Materials (ASTM) International:
- a. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - b. ASTM A106 - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

- c. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
  - d. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
  - e. ASTM A795 - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
  - f. ASTM B32 - Standard Specification for Solder Metal.
  - g. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  - h. ASTM B247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
  - i. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  - j. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.
  - k. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
  - l. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - m. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
  - n. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
  - o. ASTM E596 - Standard Test Method for Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures.
  - p. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
  - q. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
11. American Welding Society:
- a. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  - b. AWS D1.1 - Structural Welding Code – Steel.
12. American Water Works Association (AWWA):
- a. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  - b. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - c. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
13. FM Global:
- a. FM P7825 - Approval Guide, (Factory Mutual).
  - b. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
14. International Electrical Testing Association:
- a. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
15. Intertek Testing Services (Warnock Hersey Listed):
- a. WH - Certification Listings.
16. Manufacturers Standardization Society of the Valve and Fittings Industry:

- a. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - b. MSS SP 67 - Butterfly Valves.
  - c. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - d. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
  - e. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - f. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
  - g. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
  - h. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
  - i. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
17. National Electrical Manufacturers Association:
- a. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - b. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
  - c. NEMA MG 1 - Motors and Generators.
18. National Fire Protection Association:
- a. NFPA 13 - Installation of Sprinkler Systems.
  - b. NFPA 13R - Standard for Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height.
  - c. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
  - d. NFPA 20 - Standard for the Installation of Centrifugal Fire Pumps.
  - e. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
  - f. NFPA 70 - National Electrical Code.
  - g. NFPA 72 - National Fire Alarm Code.
  - h. NFPA 99 - Standard for Health Care Facilities.
  - i. NFPA 2001 - Clean Agent Fire Extinguishing Systems.
19. Underwriter Laboratories, Inc.:
- a. UL 263 - Fire Tests of Building Construction and Materials.
  - b. UL 393 - Indicating Pressure Gages for Fire-Protection Service.
  - c. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service.
  - d. UL 448 - Pumps for Fire Protection Service.
  - e. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - f. UL 778 - Motor Operated Water Pumps.
  - g. UL 1478 - Fire Pump Relief Valves.
  - h. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - i. UL 1887 - Fire Tests of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.
  - j. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - k. UL - Fire Protection Equipment Directory.

- I. UL - Fire Resistance Directory.
- m. Warnock Hersey - Certification Listings.

### **1.9 SUBMITTALS**

- A. Section 21 0502 – Fire Protection Shop Drawings and Submittals, Substitutions and O&M Manuals.
- B. The Contractor shall submit Certificates of Compliance for the following:
  - 1. Schedule of UL listed through penetration assemblies.

### **1.10 ELECTRICAL EQUIPMENT**

- A. Refer to Section 21 0503 of this manual for the requirements relating to electrical equipment.

### **1.11 CONTROL WIRING**

- A. Refer to Section 21 0503 of this manual for the requirements relating to wiring.

### **1.12 QUALITY ASSURANCE**

- A. The Contractor shall coordinate his work with that of the other trades. Where interference with other trades occurs, the Contractor shall present his solutions to the Professional. The Professional shall make the final decision regarding changes to be made in the work.
- B. The Contractor shall thoroughly familiarize himself with all specifications and drawings for the project so that he clearly understands his responsibility in relationship to the work to be performed. The Contractor shall plan and perform his work so as to permit the use of the building at the earliest possible date.
- C. The Contractor shall guarantee all work, materials, and equipment, furnished against defects, leaks, performance and non-operation for a period of one (1) year after the date of the Owner's final acceptance. Defects shall be interpreted as defective materials or equipment or unsatisfactory installation and are not intended to apply to ordinary wear and tear. The Contractor shall pay for any repairs or replacements caused by these defects within the period covered by the guarantee, including all incidental work required to correct the deficiency.
- D. The Contractor shall expressly and completely follow all manufacturers' instructions required for validation of the manufacturer's warranty agreement including but not limited to service, maintenance, and adjustments of the equipment.
- E. The Contractor is responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the contract documents.
- F. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code—Steel".
- G. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications":
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping".
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- H. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### **1.13 CLOSEOUT SUBMITTALS**

- A. Division 01- Execution and Closeout Requirements.
- B. Project Record Documents: Record actual locations of components and tag numbering.

1. Changes from the contract drawings necessary to coordinate the work with other trades, to conform to the building conditions or to conform to the rules and regulations of authorities having jurisdiction shall be made only after obtaining written permission from the Professional.
2. The Contractor shall keep a record of construction changes and deviations from the original contract drawings. All changes shall be recorded on a separate set of prints, which shall be kept at the job site specifically for that purpose. The record shall be made immediately after the work is completed. Documentation shall include the following:
  - a. Location and elevation of new and existing utility lines.
  - b. Points of connection to existing utility lines.
  - c. Changes in pipe routing location.
  - d. Valve locations.
  - e. Equipment locations, etc.
  - f. Actual capacities and values of equipment provided as indicated in equipment schedules.
3. The marked up record set of drawings shall be delivered to the Professional before final acceptance of the fire protection contract work.
4. Operation and Maintenance Data: Submit spare parts lists.

#### **1.14 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code - Steel".
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
  1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping".
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Fire Protection Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- D. Maintain one copy of each document on site.

#### **1.15 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.
- C. The Contractor shall be licensed by the North Carolina State Board of Examiners of Plumbing, Heating, and Fire Sprinkler Contractors. The contractor may be required to furnish evidence of satisfactory performance on previous sprinkler system installations of equivalent size, type, and complexity.

#### **1.16 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

- C. The Contractor is responsible to verify the location of any and all existing underground utilities in the vicinity of his work. When it has been indicated that these utilities are to remain in place, the Contractor shall provide adequate means of support and protection during excavation operations.
- D. Before ordering any equipment and material, or performing any work, the Contractor shall verify all measurements and dimensions at the job site. The Contractor is responsible for the correctness of this information.
- E. No extra compensation will be considered based on differences between actual dimensions and measurements and those indicated on the drawings.
- F. Any differences identified by the Contractor shall be submitted to the Professional for consideration before proceeding with the work.

**1.17 DELIVERY, STORAGE AND HANDLING**

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store valves in shipping containers, with labeling in place.
- C. At his own expense, the Contractor shall protect his work, materials or equipment that is subjected to damage during the project duration. All openings into any piping, ducts or equipment shall be securely covered, or otherwise protected, to prevent injury due to carelessly or maliciously dropped tools or materials, grit, dirt, or any foreign material. The Contractor is responsible for all damage until his work is fully and finally accepted.
- D. The Contractor is responsible to provide protection for motors, pumps, electrical equipment, and all similar items of equipment from dirt, grime, plaster, water, etc. during all phases of construction. This protection shall be provided by covering equipment with transparent plastic sheeting and/or locating the materials and equipment in an area free from the elements.
- E. Furnish cast iron and steel valves with temporary protective coating.
- F. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

**1.18 COORDINATION**

- A. All existing service utilities shall remain active during the construction. Any service underground, aboveground, interior, or exterior damaged, broken, or otherwise rendered inoperative during the course of construction due to activities on the part of the Contractor shall be properly repaired by the Contractor, at his own expense. The method used in repairing, replacing, or maintaining the services shall be submitted to the Professional for review and approval.
  - 1. The Contractor shall schedule his work to avoid any major interruption of any utility services.
  - 2. Existing utilities serving occupied facilities shall not be interrupted except when such interruptions have been authorized in writing by the Owner or the Professional. Interruptions may occur only after acceptable, temporary utility services have been provided. The Contractor shall provide a minimum of ten (10) working days' notice to the Professional and receive written notice to proceed before interrupting any utility.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 - Access Doors and Frames.

**1.19 CONCRETE**

- A. Concrete shall comply with Division 03 of the Project Manual.
- B. Reinforcing shall conform to ASTM A 615, Grade 60. Concrete exposed to freezing and thawing, salts, sulfates, and corrosion shall comply with North Carolina State Building Code.
- C. All concrete shall be of minimum 3000 pounds per square inch (psi) strength in (twenty-eight) 28-days. All concrete shall be mixed by machine. No wet or moistened mixture containing cement shall remain unplaced for a period exceeding (thirty) 30-minutes and shall not be used after its initial set. Re-tempering after initial set is prohibited. Exposed surfaces shall be protected from drying for at least (seven) 7-days. All forms shall be built true and rigid. Form removal shall not injure the concrete.
- D. All concrete is to be finished with a hard, smooth troweled finish and is to be faced smooth with rounded corners.

**1.20 PAINTING**

- A. All exposed piping within finished areas shall be painted to match the adjacent surfaces. Refer to the architectural finish schedules for color selections.
- B. Properly prepare all surfaces before applying paint. Remove all foreign material and clean surface to be painted according to the paint manufacturer's recommendations.
- C. Apply proper primers and sealers as recommended by paint manufacturer.
- D. Refer to Division 09 – Painting for additional information regarding materials and requirements.
- E. All sprinkler heads installed in the piping system to be painted shall be covered with protective baggies by the fire sprinkler contractor as they are installed. Once the painting is complete the baggies shall be removed as directed by the contractor. Any painted or damaged sprinkler heads shall be replaced at no additional cost to the Owner.
- F. Refer to Division 21 Sections for additional information regarding the painting of piping.

**1.21 RELATED WORK**

- A. All work related to providing complete fire protection systems and equipment is the responsibility of the Contractor. The following related work shall be provided as indicated in other specification divisions, unless noted otherwise, but shall remain the responsibility of the Contractor for workmanship and completeness.
  - 1. General Contractor:
    - a. Installation of access panels.
    - b. Final painting of existing walls, floors, and ceilings where the surfaces are being refinished and remodeled under the General Contract. Refer to General Construction Drawings.
  - 2. Mechanical Contractor:
    - a. Coordinate equipment, ducts, and pipes for interference with fire protection system installation and performance.
  - 3. Electrical Contractor:
    - a. Verification of the proper rotation of three-phase equipment, and making modifications as required correcting improper rotation.
    - b. Installation of all combination starters/-disconnects and overload protectors.
    - c. Coordinate equipment, ducts, and pipes for interference with fire protection system installation and performance.

**1.22 MISCELLANEOUS STEEL AND ACCESSORIES**

- A. The Contractor shall provide all necessary steel angles, channels, pipe, rods, nuts, bolts, etc., as shown on plans, as specified, or as may be required for complete and proper installation of plumbing fixtures, systems, and equipment. All material and workmanship shall be of the best quality and shall be installed in accordance with the best practices of the trade.

### **1.23 ACCESS PANELS**

- A. The Contractor shall furnish access doors to the General Contractor for installation in ceilings, walls, partitions, and floors for access to valves and other appurtenances.
- B. Access panels shall be of sufficient size to permit removal or access to equipment, except that the minimum size shall be (twelve) 12-inches by (sixteen) 16-inches.
- C. Access door locations shall be as determined by field conditions for optimum access to equipment and shall be reviewed by the Professional before final installation and shall be subject to the following.
  - 1. Bottom of access doors shall not be lower than the top of the partition base, or minimum of (six) 6-inches above floor.
  - 2. Tops and/or sides of access panels shall be a minimum of (six) 6-inches from the ceiling or opening or from the edge of a wall return.
- D. Doors shall be suitable for installation in the finish material of the ceilings, walls, partitions, and floors.
- E. Frame and panel access doors in restrooms, kitchens and as indicated shall be stainless steel.
- F. Access doors with UL Listing shall be provided in rated construction assemblies. Access doors shall be "B Label" and shall have a UL one and one-half (1 1/2) hour rating at 250 degrees F rating for both door and frame. Maximum size shall be 20" x 20" or 400 square inches in area. Frame shall be sixteen (16) gauge minimum steel. The panel shall be twenty (20) gauge minimum steel. Access doors shall be provided with a baked-on enamel finish (prime coat), continuous type hinge on one side, flush face type lock with key operation and self-latching cylinder locks.
- G. Access doors without UL label shall be provided in all non-rated construction assemblies. Frame shall be sixteen (16) gauge minimum steel. The panel shall be fourteen (14) gauge minimum steel. Access doors shall be provided with a baked-on enamel finish (prime coat), concealed spring type hinges and flush-face type lock with key operation and self-latching cylinder locks. Door shall open 175 degrees (minimum).
- H. All access doors shall be keyed alike.

### **1.24 CLEANUP**

- A. The Contractor shall maintain buildings, grounds, and public properties free from accumulations of waste materials, debris, and rubbish. At reasonable intervals during the progress of work, and when directed by the Owner's authorized representative, the site and public properties shall be cleaned. All waste materials, debris, and rubbish shall be disposed of in appropriate manner. The Contractor shall provide containers for collection of waste materials, debris, and rubbish. Waste materials, debris, and rubbish shall be removed from the job site and legally disposed of at a landfill area in accordance with all applicable regulations. Burning or burying waste materials, debris, or rubbish on project site is prohibited.
- B. At the completion of the project, the Contractor shall remove waste materials, rubbish, tools, equipment, machinery, surplus materials, etc., and clean all sight exposed fire protection fixtures and equipment. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight exposed fire protection fixtures and equipment. Broom clean paved and concrete surfaces. Rake clean other ground surfaces. Repair, patch and touch up marred surfaces to the specified finish or to match adjacent surfaces.

### **1.25 INSPECTION AND TESTING**



- A. New fire protection systems and parts of existing systems, which have been altered, extended, or repaired, shall be tested to disclose leaks and defects.
- B. The Contractor shall develop a written test procedure for the Project. This procedure shall meet the requirements defined in NFPA 13. The test procedure shall be submitted to the Design Team for review a minimum of four (4) weeks before any testing begins.
- C. The sprinkler system testing shall include all of the system components including flow switches and tamper switches. The system shall be complete including the interfaces with the building fire alarm system prior to any system demonstrations.
- D. The Contractor shall notify the Professional a minimum of five (5) working days prior to testing to coordinate the testing and inspection procedures.
- E. If the Professional determines that the fire protection systems do not pass the prescribed tests, then the Contractor shall be required to make the necessary repairs, at his own expense, and the Contractor shall re-inspect and re-test the systems. Repairing, inspection, and testing shall be continued until all systems pass as determined by the Professional.
- F. All new, altered, extended, or replaced fire protection shall be left uncovered and unconcealed until it has been inspected, tested and accepted by the Professional. Where such work has been covered or concealed before it has been inspected, tested, and accepted, it shall be uncovered by the Contractor, at his own expense as directed by the Professional.
- G. All equipment, material, labor, etc. required for testing the fire protection systems shall be furnished by the Contractor.

**1.26 INSTRUCTION OF THE OWNER**

- A. After acceptance of the Project, the Contractor shall furnish the services of personnel thoroughly familiar with the completed installation to instruct the Owner in the proper operation and maintenance of all equipment and appurtenances provided.
- B. The Contractor shall provide the Owner with two weeks advance notice before the instruction session.

**1.27 CUTTING, PATCHING, FINISHING**

- A. Unless otherwise noted, the Contractor shall cut, patch, and finish all chases and openings required for the installation of work to be performed under this Contract. All patching and finishing shall match existing adjacent undisturbed surfaces.
- B. Cutting shall not cause damage to the building or leave unsightly surfaces. The Contractor is responsible for the repair of these conditions.
- C. The Contractor shall contact the holder of the roofing guarantee and obtain his written approval before cutting the roofing membrane.
- D. No structural member shall be cut.
- E. Penetrations made in existing fire rated chases, partitions, floors, etc. shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.
- F. All materials and methods to be used for patching and repairing shall be subject to the approval of the Professional and the Owner's Authorized Representative.
- G. The Contractor shall set all sleeves, hangers, and anchors required for the Fire Protection Contract work and shall be responsible for their proper and permanent location.
- H. No cutting shall be done which may affect the building structurally or architecturally without first securing the approval of the Professional. Cutting shall be accomplished in such a manner as not to cause damage to the building or leave unsightly surfaces, which cannot be concealed by plates, escutcheons, or other construction. Where such unsightly conditions are caused, the Contractor shall be required, at his own expense, to repair the damaged areas.

- I. Cutting of the construction excessively or carelessly done shall be repaired to match the original work by the Contractor and to the satisfaction of the Professional who will make the final decision with respect to excessive or careless cutting work. The Contractor shall seal all openings he has made in plenum spaces, fire rated floors, ceilings or partitions after his work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling, or partition material.
- J. Where present equipment is removed and unused openings remain in walls, floors, partitions, etc., the Contractor shall properly patch all such openings except as specified under "Work by Others." All patching and repairing shall be done by workmen skilled in this type of work and shall match present or new finishes.
- K. Cutting, patching, and repairing of openings in the existing exterior walls and roof shall be by the General Contractor.

#### **1.28 CHASES AND OPENINGS**

- A. All chases and openings required for the installation of the work shall be coordinated with the other trades. The Contractor shall provide the other trades with sufficient time (one (1) week minimum) for coordination of all chases and openings. The Contractor shall be responsible for all work required cutting and patching the required openings. The work shall be performed to the satisfaction of the Professional.
- B. Penetrations made in fire rated chases, partitions, floors, etc. shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.
- C. The Contractor shall provide all sleeves, hangers, and anchors required for installation of the work in chases and openings.

### **PART 2 - PRODUCTS**

#### **2.1 PIPE, TUBE, AND FITTINGS**

- A. All materials used on fire protection systems shall meet the requirements of applicable codes, standards, and requirements of local authorities having jurisdiction and the Owner's insurance carrier.
- B. Refer to individual Division 21 Sections for pipe, tube, and fitting materials and joining methods.

#### **2.2 SLEEVES, MECHANICAL SLEEVE SEALS, ESCUTCHEONS, AND GROUT**

- A. Refer to individual Division 21 Sections.

#### **2.3 VALVES**

- A. Refer to Section 21 1105 – GENERAL DUTY VALVES FOR FIRE PROTECTION PIPING.

#### **2.4 PIPE HANGERS AND SUPPORTS**

- A. Refer to Section 21 1104 – HANGERS AND SUPPORTS.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. All materials, equipment and accessories specified in this section shall be installed in strict accordance with NFPA 13, NFPA 14, NFPA 20, and North Carolina Department of Insurance.
- B. All piping in finished areas shall be run concealed. The Contractor shall furr in piping or provide soffiting as required and in accordance with the Professional's instructions. All piping shall be installed as required to suit space available in building structure, above suspended ceilings, and other locations found necessary for installation. Install piping as high as possible.
- C. The Contractor shall not install any piping that will interfere with any lights, openings, doors, windows, ductwork, equipment, and existing or special conditions. Headroom in front of openings, doors, or windows shall not be less than the top of the opening. Provide all piping offsets

necessary to avoid interference with other work. Piping offsets shall include all devices and assemblies necessary to accommodate the change in direction of the piping.

- D. All piping shall run straight with no more couplings and joints than necessary, shall be grouped wherever practical and shall be carefully installed to provide for proper alignment slope and expansion.
- E. Pipes carrying fluids shall not be installed in transformer vaults, electrical equipment rooms, elevator hoistways, elevator equipment rooms, or similar areas having a collection of electrical equipment. Pipes shall not be installed over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals, boxes, or similar electrical equipment.
- F. All materials and equipment used shall be installed in strict accordance with the Standards under which the materials are accepted and approved, and in strict accordance with the manufacturer's instructions.
- G. The contract documents are not intended to indicate every bend, offset, change in direction or appurtenance required to provide a complete and workable system.
- H. The contract drawings are diagrammatic and are indicative of the work to be performed. It is not intended that they show every pipe, fitting or apparatus required for a complete installation.
- I. Except where otherwise indicated, minimum cover of exterior piping shall not be less than three (3) feet.

### **3.2 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. All piping shall be installed with not less than 2-inches between finish covering of pipe and all other work or piping.
- E. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted.
- F. Bullhead connections in any piping service are prohibited.
- G. All screwed joints shall be made with a non-corrosive, non-hardening compound or Teflon tape applied on the male thread only. All compounds must be approved for the pipe on which they are used. Pipe ends shall be reamed or filed out to size of bore and all chips and cuttings removed. Ends of pipe must be cut square so as to seat in the bottom of the recess in drainage fittings. In making joints in chromium plated brass pipe no more than one thread shall remain exposed when joint is completed. Caulking of screwed joints is not permitted. Pipe joint cement and paint will be permitted only on external threads.

### **3.3 INSTALLATION**

- A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, NFPA 20 for fire pump, and NFPA 24 for service mains.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install pipe sleeve at piping penetrations through footings, partitions, walls, and floors. Seal pipe and sleeve penetrations to maintain fire resistance equivalent to fire separation.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping. Riser clamps at exposed locations shall be of such design as to avoid creating a hazardous

or unsightly condition and stay within space limitations. Pipe supports are required at the base of all vertical risers and shall be of riser size.

- H. Slope piping and arrange systems to drain at low points. Install eccentric reducers to maintain top of pipe level.

### 3.4 VALVES

- A. Valves shall be installed at each riser, branch to floor, and where shown on the drawings. Valves shall be installed with stems at or above the horizontal plane.
- B. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- C. Install gate, ball, or butterfly valves for shut-off or isolating service.
- D. Install drain valves at main shut-off valves, low points of piping and apparatus.

### 3.5 SLEEVES

- A. Sleeves shall be provided for all pipes passing through walls, partitions, floor slabs or roof slabs. Sleeves shall be cut flush with wall, floor or ceiling surfaces except that sleeves through waterproofed roof or floor slabs shall extend above the finished surface. Sleeves shall be sufficient size to allow a sealable annular space between the sleeve and the pipe or between the sleeve and the pipe insulation. All exposed piping passing through floors, walls or ceiling shall be provided with a chrome escutcheon plate securely fastened around the pipe. The annular space around the pipe in non-water-proof sleeves shall be filled with penetration sealant and smoothed out flush with all surfaces.
- B. All pipe, tube, conduit, or similar through-penetrations of all fire rated walls, floor-ceiling, or roof-ceiling assemblies shall be provided with a fire stopping system to achieve a tight seal that will maintain the fire-resistant rating of the assembly containing the through-penetration. Fire stopping system may be sealant or mechanical type.
- C. Sleeves are not required for core-drilled holes.
- D. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2-inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2-inches above finished floor level. Refer to Division 07 – “Sheet Metal Flashing and Trim” for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 - "Joint Sealants" for materials and installation.

- E. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6-inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6-inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- F. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- G. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Refer to Division 07 - "Penetration Fire-stopping" for materials.

### **3.6 PAINTING AND IDENTIFICATION**

- A. Painting:
  - 1. All painting shall be done in a careful, neat and workmanlike manner, with particular care being exercised to protect building equipment and finishes. All surfaces shall be thoroughly cleaned of rust, scale, dirt, grease, dust, and like items, and sanded so as to provide a bond for new paint. All painted surfaces under this Contract shall be finished in an acceptable manner.
  - 2. All steel piping, equipment, supports, hangers and other iron and steel work in crawl spaces that is not factory painted, coated, or galvanized, installed under this Contract, shall be painted with two (2) coats of Rust-Oleum rust preventative paint, or approved equal. First coat shall be Rust-Oleum No. X-60 red primer, or accepted substitute. The second coat shall be Rust-Oleum No. 634 black gloss, or accepted substitute.
- B. Pipe Identification:
  - 1. All piping shall be provided with identification markers. Markers shall be provided as follows:
    - a. On straight runs of piping at intervals not exceeding 20-feet.
    - b. Within 2-feet of all elbows.
    - c. Within 2-feet of all piping as it passes through partitions (markers provided on both sides of partitions).
- C. Valve Tags:
  - 1. The Contractor shall tag each new valve furnished under this contract. The Contractor shall prepare three (3) lists on heavy white paper giving the valve number, its location, and the equipment controlled. One (1) list shall be enclosed in a metal frame under glass and mounted in the building where directed by the Owner. The other two (2) copies shall be delivered to the Architect.
- D. Ceiling Panel Identification:

1. Provide colored plastic buttons and secure to lay-in ceiling tiles to identify access points for valves.

### **3.7 INTERFACE WITH OTHER PRODUCTS**

- A. Inserts:
1. Install inserts for placement in concrete forms.
  2. Install inserts for placement in concrete forms.
  3. Install hooked rod to concrete reinforcement section for inserts carrying pipe over 4-inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

### **3.8 PENETRATIONS AND ESCUTCHEONS**

- A. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
  2. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
  3. Insulated Piping: One-piece, stamped-steel type with spring clips.
  4. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
  5. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
  6. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
  7. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
  8. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
  9. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
  10. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

### **3.9 CLEANING**

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Clean entire system after other construction is complete.

**END OF SECTION 21 0501**

## SECTION 21 0502

### FIRE PROTECTION SHOP DRAWINGS AND SUBMITTALS, SUBSTITUTIONS AND O&M MANUALS

#### PART 1 - GENERAL

##### 1.1 REQUIREMENTS

- A. Drawings and general provisions of the contract documents including General and Supplementary Conditions and Division 00 and 01 Specification sections apply to all work in this section.
- B. All catalog data, shop drawings, calculations and certificates of compliance shall be submitted as a single package. Failure of the Contractor to provide a complete submittal package may result in delay in processing time. All such delays to the project resulting from the Contractor's failure to provide submittals at one time will be the responsibility of the Contractor.
- C. Fire Sprinkler Contractor: The Contractor shall submit working shop drawings, hydraulic calculations, and product data to the design engineer of record – quantities as listed in the General Conditions or as otherwise indicated in the Division 21 Specifications. Shop drawings should include and be in accordance with working plan requirements of chapter 22 of NFPA 13. Product data should include and identify all material, equipment, and accessory selections to be installed. The hydraulic calculations and shop drawings should be signed by the fire sprinkler designer and include the NC Fire Sprinkler Contractor (FS) license number.
- D. Project Engineer: The specifying engineer (PE) has primary responsibility for review and approval of fire suppression system shop drawings and hydraulic calculations. Specifying Engineer review shall determine compliance with applicable codes and standards and the project contract documentation. After completing this review, the Specifying Engineer sends one (1) copy with a signed cover letter, including printed reviewer name, summarizing the outcome to the State Construction Office for approval. If comments by the design engineer are minor in nature, the engineer may, at their discretion, forward the shop drawings to this office in parallel with comment resolution by the fire sprinkler contractor. All comments made by the designer should be forwarded to this office with the review package including comments from previous review iterations, if any.
  1. For mail by US Postal Service:
    - a. Assistant Director  
Design Review  
State Construction Office  
1307 Mail Service Center  
Raleigh, NC 27699-1307
  2. For Mail by UPS, FedEx, etc.
    - a. Assistant Director  
Design Review  
State Construction Office  
301 N. Wilmington Street, Suite 450  
Raleigh, NC 27601
- E. Once all comments are resolved and approved by SCO, an approval letter releasing this part of project to enter into construction will be sent to the Specifying Engineer. No other reviews are required after the receipt of this approval letter.

##### 1.2 DEFINITIONS

- A. Shop Drawings: Project shop drawings and other data prepared specifically for fulfillment of the project requirements. Shop drawings include fabrication, layout, setting, installation, coordination and similar drawings and diagrams, and include performance data associated therewith, including weights, capacities, speeds, outputs, consumption, efficiencies, voltages, amperages, cycles, phases, noise levels, operating ranges, and similar information.
- B. Samples: Units of typical work, materials, or equipment items, showing the workmanship, pattern, trim and similar qualities proposed for the work to be provided, as designated.
- C. Manufacturer's Data: Product manufacturer's standard printed product information, including promotional brochures, product specifications, installation instructions and diagrams, statements of compliance with standard performance charts or curves, and similar information concerning the standard portions of the manufacturer's products.
- D. Test Reports: Specific reports prepared by independent testing laboratories and others, showing the results of specified testing on either the material/equipment provided or on identical material/equipment, and on installed electrical systems.
- E. Industry Standards: Printed copies of the current standards recognized in the industry. Current means the latest issue as of the date of these specifications, unless otherwise indicated; within the text of these specifications the date-suffix frequently shown with identification numbers has been omitted.
- F. Manufacturer's Product Warranties: Manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the Manufacturer, when and if the product fails within certain operational conditions and time limits.
- G. Operating Instructions: The written instructions by the manufacturers, fabricators, or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control, and shutdown of each operating item of the equipment and each electrical system.
- H. Maintenance Manuals: The compiled information provided for the Owner that certain acts of restitution will be performed when and if certain portions of electrical work fail within certain operational conditions and time limits.
- I. Final Inspection: At the final inspection, the fire sprinkler contractor should have for review and closeout documentation all pertinent NFPA paperwork properly filled out on NFPA forms as applicable (NFPA 13, 14, 20, 24). The shop drawing approval letter from this office should be available. A set of as-built fire sprinkler shop drawings and hydraulic calculations shall be placed in a white PVC tube marked 'Fire Sprinkler Shop Drawings' and securely fixed in the fire sprinkler riser room.

### **1.3 SUBMITTAL FORM AND PROCEDURES**

- A. General: Comply with Division 1 requirements for identification, quantities processing, scheduling, and similar general requirements, except as otherwise indicated. Submittals shall be complete, in one package, clearly identified and cross-referenced to the appropriate specification section defining the submitted item. Partial submissions will not be addressed. The Contractor is responsible for any delays caused by incomplete submittal packages.
- B. Quantities: Provide quantities as listed in the General Conditions or as otherwise indicated in the Division 21 Specifications.
- C. Presentation: Submittals shall be assembled in three ringed binders with each specification section separated by a tab on which the specification section is noted. The submittals shall be clearly marked indicating which specific item is being considered and all its related information. Submittals not complying with these requirements are subject to being returned without being reviewed.



- D. Should Contractor desire to substitute another manufacturer's equipment for one specified by name, the contractor shall apply in writing at least ten (10) days prior to bid date for such permission. He shall provide supporting data and samples for Engineers consideration. No substitution shall be made for any material, article, or process required under the contract unless approved by the Engineer.
- E. Any time that is required by the Engineer for a request to review submittals for substitute equipment after the award of bids will be billed to the contractor at the Engineer's current hourly billing rate. The Engineer's review time will be billed to the contractor whether the proposed substitution is accepted or rejected.
- F. Operating Instructions: The written instructions by the manufacturer, fabricator, or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation.
- G. Response to Submittals: Where standard product data have been submitted in fulfillment of project requirements, it is recognized that the submitter has already determined that the products fulfill the specified requirements, and that the submittals are for the Architects' or Engineers' information only but will be returned without action where observed to be non-complying with the requirements. Where uniquely prepared information is submitted, it is recognized to represent the preparer's interpretation or solution to the specified requirements, subject to the Architects', or Engineers' concurrence and appropriate action as indicated in Division 01.
- H. Shop Drawings and Samples: After checking and verifying all field measurements, the Contractor shall submit to the Engineer for review, in accordance with the accepted schedule of shop drawings submissions, copies of all shop drawings, which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The data shown on the shop drawings shall be complete with respect to dimensions, design criteria, materials of construction and the like to enable the Engineer to review the information as required.
- I. The Contractor shall also submit to the Engineer for review, with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers, and the use for which intended.
- J. At the time of each submission, the Contractor shall in writing call the Engineer's attention to any deviations that the shop drawings or sample may have from the requirements of the Contract Documents.
- K. No work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by the Engineer. A copy of each shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.
- L. The Engineer's review of shop drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to such deviation at the time of submission and the Engineer has given written approval to the specific deviation, nor shall any review by the Engineer relieve the Contractor from responsibility for errors or omissions in the shop drawings.
- M. The Contractor's shop drawing stamp shall indicate that the shop drawings have been checked for conformity to the Contract Documents and appropriate means have been taken to ensure that the material and /or equipment will fit into the space available. Shop drawings will be returned without review if the submittals do not have the Contractor's stamp, or the submittals have not been reviewed by the Contractor.
- N. The Engineer's review of shop drawings is for general conformance with design concept only. The Contractor is responsible for all quantities, dimensions, and coordination of the work of all trades. Corrections or comments made on the shop drawing during this review do not relieve the contractor from compliance with requirements of the contract documents. The Contractor is

responsible for selecting fabrication processes and techniques of construction and for performing all work in a safe and satisfactory manner.

- O. The Contractor shall stamp the shop drawings and submittals and verify by his/her signature that the shop drawings and submittals have been checked for compliance with the contract documents.
- P. The Contractor shall provide TABLE A as a cover letter with the submittals. The "Date Submitted" column shall be filled in by the Contractor. The remaining three columns are for the Engineer's use.

#### **1.4 GENERAL SUBMITTAL REQUIREMENTS**

- A. Applicability: Wherever it is indicated that a shop drawing, sample, manufacturer's brochure, certification, test, copy of standard operating instruction, manual, extra stock, guarantee, or warranty is required, the appropriate submittal is required regardless of whether it is specified as a "submittal"; the Architects' or Engineers' decision shall be final. Include SCO ID number on all submittals including hydraulic calculations and product data.

#### **1.5 SUBSTITUTIONS**

- A. Refer to the General Conditions for the requirements relative to substitutions.
- B. Substitutions: Fire Protection submittals are not opportunities for gaining acceptance of substitutions. Where three or more manufacturers are specified by name, or by catalog reference, Contractor shall select for use any of those so specified.
- C. Should Contractor desire to substitute another manufacturer's equipment for one specified by name, the contractor shall apply in writing at least ten (10) days prior to bid date for such permission. He shall provide supporting data and samples for Engineers consideration. No substitution shall be made for any material, article, or process required under the contract unless approved by the Engineer.
- D. Any time that is required by the Engineer for a request to review submittals for substitute equipment after the award of bids will be billed to the contractor at the Engineers current hourly billing rate. The Engineers review time will be billed to the contractor whether the proposed substitution is accepted or rejected.

#### **1.6 OPERATION AND MAINTENANCE MANUALS**

- A. Submit two (2) sets of 8-1/2" x 11" text as well as full-size drawings sixty (60) days prior to operator training/pre-final inspection bound in three D side ring capacity expansion binders with durable plastic covers for review by the Professional.
- B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed, or printed on thirty (30) pound white paper.
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Professional, Contractor, Subcontractors, and equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions arranged by system or process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.

- d. Maintenance instructions for equipment and systems.
  - e. Maintenance instructions for finishes, including recommended cleaning methods and materials and Operating instructions.
  - f. Special precautions identifying detrimental agents.
  - g. Special Requirements of other sections of this specification noted to be included in the operating and maintenance manual.
3. Part 3: Project documents and certificates, including the following:
- a. All approved Submittals.
  - b. Certificates of Compliance.
  - c. Photocopies of warranties and bonds.
  - d. Material safety data sheets.
- E. Submit five (5) copies of completed volumes in final form fifteen (15) days prior to owner training. These copies will include Professional's previous review comments.
- F. Submit eight final volumes revised, within ten (10) days after pre-final observation.

**PART 2 - PRODUCTS (This Part Not Used)**

**PART 3 - EXECUTION (This Part Not Used)**

**END OF SECTION 21 0502**

**TABLE A - Shop Drawings Required**

<b>Shop Drawings and Submittals Required for this Project</b>	<b>Date Submitted by Contractor</b>	<b>Date Received by Engineer</b>	<b>Date Returned by Engineer</b>	<b>Status</b>
21 05 01 – Common Work for Fire Suppression				
21 05 13 – Electrical Work for Fire Protection				
21 05 53 – Identification				
21 11 01 – Fire Protection Piping and Fittings				
21 11 02 – Valves for Fire Protection				
21 11 04 – Hangers and Supports				
21 23 13 – Wet Pipe Sprinkler Systems				
21 30 01 - Fire Pumps				

I have reviewed the shop drawings and submittals listed above for compliance with the contract documents.

\_\_\_\_\_  
 Contractor's Signature

**SECTION 21 1101  
FIRE PROTECTION PIPING**

**PART 1 - GENERAL**

**1.1 REQUIREMENTS**

- A. Drawings and general provisions of the contract documents including General and Supplementary Conditions and Division 00 and 01 Specification sections apply to all work in this section.
- B. Fittings shall be UL listed or FMG approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping.
- C. All piping material shall be manufactured in the USA.

**1.2 SECTION INCLUDES**

- A. Work in this Section includes the following:
  - 1. Automatic sprinkler system piping.
  - 2. Fire Pump system piping.

**1.3 RELATED SECTIONS**

- A. All sections of the Project Manual apply to this section.

**1.4 REFERENCES**

- A. Refer to Section 21 0501 for complete listing of references.

**1.5 SUBMITTALS**

- A. Section 21 0502 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Requirements for submittals.
- B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.
- C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. The Contractor shall submit manufacturer's catalog data for the following:
  - 1. Automatic sprinkler system piping.
  - 2. Fire Pump system piping.

**PART 2 - PRODUCTS**

**2.1 FIRE PROTECTION SYSTEM PIPING**

- A. Aboveground:
  - 1. Steel Pipe: ASTM A53, ASTM A795, Schedule 10 and 40 black.
    - a. Steel Fittings: ASME B16.9, wrought steel, butt-welded, ASME B16.25, butt-weld ends, ASTM A234, wrought carbon steel and alloy steel, ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
    - b. Cast Iron Fittings: ASME B16.1, flanges, and flanged fittings, ASME B16.4, threaded fittings.
    - c. Malleable Iron Fittings: ASME B16.3, threaded fittings ASTM A47.

- d. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
    - 1) Rigid Type: Housings shall be cast with bolt pad to provide system rigidity and support and hanging in accordance with NFPA 13.
      - a) 1-1/4" – 4": Rigid coupling designed for direct installation onto grooved end pipe without prior field disassembly.
      - b) 5" and Larger: Standard rigid coupling.
    - 2) Flexible Type: Use in seismic areas where required by NFPA 13.
  - e. Mechanical Grooved Fittings: ASTM A536 ductile iron and ASTM A53 steel fittings with grooved ends designed to accept couplings.
  - f. All fire main piping at the fire pump and within the fire pump room shall be joined by flanges. Refer to the contract drawings.
2. Flexible Piping:
- a. FM and UL listed flexible stainless steel piping systems (e.g., FlexHead, Flex-Arm) shall not be used unless prior approval is obtained from the SCO. Many faulty installations of the products have been observed in the past projects. Flexible pipes have been crimped permitting limited or no water flow, hose connections of extended lengths, small radius bends, and large number of turns, have been encountered. If flex pipes are to be used a strict manufacturers' installation instructions and limits shall be enforced. Flexible piping systems, if approved, are limited to FM and UL listed systems with a braided jacket. Unbraided assemblies will not be approved.

## **2.2 SPRINKLER PIPING IN CORROSIVE ENVIRONMENT: NATATORIUM POOL EQUIPMENT ROOM, CHEMICAL STORAGE, ETC.**

- A. CPVC Pipe: ASTM F442, SDR 13.5.
  - 1. Fittings: ASTM F438 schedule 40, or ASTM F439 schedule 80, CPVC.
  - 2. Joints: ASTM F493, solvent weld.
  - 3. Concealed areas only, no exposed pipe. Requirements for the protection of CPVC piping shall be in accordance with NFPA 13 and the manufacturer's guidelines.
- B. Steel Pipe: ASTM A53 or ASTM A795, Schedule 40, Galvanized:
  - 1. All sprinkler pipe shall be corrosion resistant, with a Corrosion Resistance Ratio of two (2) or greater.
  - 2. Malleable Iron Fittings: ASME B16.3, threaded fittings.
  - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts and washers.
- C. Stainless Steel Pipe: ASTM A312, Type 304/304L or 316/316L, Schedule 5, 10, or 40. Roll or Cut grooved as appropriate to the pipe material, wall thickness, pressure, size and method of joining.
- D. Stainless steel mechanical couplings: manufactured in two or more segments of cast stainless steel, conforming to ASTM A-351, A-743, and A-744. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical coupling bolts shall be stainless steel, type 316, meeting the physical properties of ASTM A-193, grade B8M, Class 2.

## **PART 3 - EXECUTION**

### 3.1 GENERAL

- A. All materials, equipment and accessories specified in this section shall be installed in strict accordance with NFPA 13[, NFPA 14] and North Carolina Department of Insurance and the manufacturer's recommendations.

### 3.2 PIPING INSTALLATION

- A. General
  - 1. All piping in finished areas shall be run concealed. The Contractor shall furr in piping or provide soffiting as required and in accordance with the Professional's instructions. All piping shall be installed as required to suit space available in building structure, above suspended ceilings, and other locations found necessary for installation. Install piping as high as possible.
  - 2. The Contractor shall not install any piping that will interfere with any lights, openings, doors, windows, ductwork, equipment, and existing or special conditions. Headroom in front of openings, doors, or windows shall not be less than the top of the opening. Provide all piping offsets necessary to avoid interference with other work. Piping offsets shall include all devices and assemblies necessary to accommodate the change in direction of the piping.
  - 3. All piping shall run straight with no more couplings and joints than necessary, shall be grouped wherever practical and shall be carefully installed to provide for proper alignment slope and expansion.
  - 4. Pipes carrying fluids shall not be installed in transformer vaults, electrical equipment rooms, elevator hoistways, elevator equipment rooms, or similar areas having a collection of electrical equipment. Pipes shall not be installed over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals, boxes, or similar electrical equipment.
  - 5. All piping shall be installed with not less than 2-inches between finish covering of pipe and all other work or piping.
  - 6. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted.
  - 7. Bullhead connections in any piping service are prohibited.
  - 8. All screwed joints shall be made with a non-corrosive, non-hardening compound or Teflon tape applied on the male thread only. All compounds must be approved for the pipe on which they are used. Pipe ends shall be reamed or filed out to size of bore and all chips and cuttings removed. Ends of pipe must be cut square so as to seat in the bottom of the recess in drainage fittings. In making joints in chromium plated brass pipe no more than one thread shall remain exposed when joint is completed. Caulking of screwed joints is not permitted. Pipe joint cement and paint will be permitted only on external threads.
  - 9. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the

product installation. Contractor shall remove and replace any improperly installed products.

**3.3 PROTECTION AGAINST PHYSICAL DAMAGE**

- A. In concealed locations, where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1¼-inches from the nearest edge of the member, shield plates shall protect the pipe. Protective shield plates shall be a minimum of 1/16-inch thick steel, shall cover the area of the pipe where the member is notched or bored and shall extend a minimum of 2-inches above sole plates and below top plates.

**END OF SECTION 21 1101**



## SECTION 21 1104

### HANGERS AND SUPPORTS FOR FIRE PROTECTION PIPING AND EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 GENERAL

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.

##### 1.2 SUMMARY

- A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Inserts.
4. Flashing.
5. Sleeves.
6. Mechanical sleeve seals.
7. Formed steel channel.
8. Firestopping relating to fire protection work.
9. Firestopping accessories.
10. Equipment bases and supports.

- B. Related Sections:

1. Division 03 - Concrete Forming and Accessories.
2. Division 03 - Cast-In-Place Concrete.
3. Division 07 – Fire-stopping.
4. Division 07 - Joint Protection.
5. Division 09 - Painting and Coating.
6. Section 21 0501 - Common Work Results for Fire.
7. Section 21 1101 – Fire Protection Piping.
8. Division 07: Installation requirements for roof flashing installation.

##### 1.3 REFERENCES

- A. Refer to Section 21 0501 for complete listing of references.

##### 1.4 DEFINITIONS

- A. Fire-stopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

##### 1.5 SYSTEM DESCRIPTION

- A. Fire-stopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction in accordance with FM or UL requirements.
- B. Surface Burning: ASTM E84 UL 723 with maximum flame spread / smoke developed rating of 25/50.
- C. Fire-stop interruptions to fire rated assemblies, materials, and components.

## **1.6 PERFORMANCE REQUIREMENTS**

- A. Fire-stopping: Conform to applicable code (FM or UL) for fire resistance ratings and surface burning characteristics.
- B. Fire-stopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

## **1.7 SUBMITTALS**

- A. Section 21 0502 – Fire Protection Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- B. Shop Drawings:
  - 1. Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers, metal framing systems, pipe stands and/or equipment supports.
  - 2. Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations.
- C. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
  - 2. Fire-stopping: Submit data on product characteristics, performance, and limitation criteria.
- D. Fire-stopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- E. Manufacturer's Installation Instructions:
  - 1. Hangers and Supports: Submit special procedures and assembly of components.
  - 2. Firestopping: Submit preparation and installation instructions.
- F. Welding certificates.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- H. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

## **1.8 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code—Steel".
  - 2. AWS D1.2, "Structural Welding Code—Aluminum".
  - 3. AWS D1.4, "Structural Welding Code--Reinforcing Steel".
  - 4. ASME Boiler and Pressure Vessel Code: Section IX.
- B. Through Penetration Fire-stopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- E. Surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.
- F. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- G. Perform Work in accordance with State, Federal and local standards approved by the Authority Having Jurisdiction.
- H. Maintain one copy of each document on site.

#### **1.9 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing Work of this section with a minimum three years' experience.

#### **1.10 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

#### **1.11 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

#### **1.12 ENVIRONMENTAL REQUIREMENTS**

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply fire-stopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3-days after installation of fire-stopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

#### **1.13 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.14 WARRANTY**

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

### **PART 2 - PRODUCTS**

#### **2.1 PIPE HANGERS AND SUPPORTS**

- A. Install in accordance with NFPA 13 for sprinkler systems.
- B. Install hangers to with minimum ½-inch space between finished covering and adjacent work.
- C. Where hanger rods are longer than 18-inches, provide lateral bracing at every fourth hanger. Do not support piping by wire, rope wood or other makeshift device. Provide additional steel

- supports where building construction does not permit the hanger spacing as specified in the schedules. Location and details shall be submitted to the Professional for review.
- D. Roller type supports shall be used for pipes subject to axial movement. Brace so movement occurs in roller rather than support rod.
  - E. Where loading exceeds the safe allowable limit for any single insert, then multiple inserts shall be installed spaced no less than 12-inches on centers. The multiple inserts shall be connected with suitable size steel angles and locking bolts.
  - F. Place hangers within 12-inches of each horizontal elbow.
  - G. Use hangers with 1½-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - H. Where fastenings are required in steel stud, wire lath or other non-masonry construction, a "J" hook and holding lock washer and nut shall be used which shall fasten to the opposite stud edge to which the item will abut. If the location of the fastening is not a steel stud, a structural steel shape shall be fastened to the wall with bolt and holding nut, with the fastening extension through the wall. The use of toggle bolts will not be permitted.
  - I. Prime coat exposed steel hangers and supports. Refer to Division 09 - Painting. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  - J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Division 09 – Painting.
  - K. Do not penetrate building structural members unless indicated.
  - L. The Contractor shall furnish and install all supports, hangers, inserts and fasteners for the items incidental to the work in the construction of the project. Supports and hangers shall be provided to suit specific conditions for the type of construction. The method adopted shall be subject to the approval of the Professional.
  - M. Supports shall secure pipes in place, prevent swaying and vibration, maintain required grading, provide free expansion, and shall have a neat appearance. Supports shall be selected for strength and service and installed in a manner, which will not stress building construction. A five (5) to one (1) safety factor relative to the gross weight of piping system including fluid shall be used in the selection of the supports.
  - N. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Only use inserts for suspending hangers from concrete slabs. Use beam clamps for suspending hangers from building steel. Do not hang one pipe from another. Do not use perforated band iron, wire, or chain as hangers. Do not use vertical expansion shields. Do not hang from joist bridging.
  - O. Fastenings installed in masonry walls shall be galvanized u-bolts set in the construction during erection.
  - P. Steel frame Construction:
    - 1. Support piping systems, devices, and equipment from structural steel members or secondary fabricated supports. Hanging from corrugated metal deck is prohibited.
    - 2. Where metal tabs integral with the metal deck are provided, support of piping, ductwork, devices, and equipment from system to the maximum of the equivalent of a 10-foot length of 4- inch diameter, Schedule 40 section of pipe filled with water, or 6-inch diameter cast iron drainage pipe. Where tabs projecting down from the metal deck system are not available, inserts for concrete deck construction shall be installed. Inserts in poured concrete slabs shall be iron, fabricated galvanized iron or steel of the type to

receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one horizontal direction.

Q. Reinforced Concrete Construction:

1. Where concrete members support concrete roof or floor construction, support piping systems, devices, and equipment from roof to floor construction by use of concrete slab inserts.
2. Inserts in poured concrete slabs shall be iron or fabricated galvanized iron or steel of the type to receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one (1) horizontal direction. Inserts shall be accurately located before the concrete is poured.
3. Piping, tanks, and equipment shall be adequately supported either by suspension from the construction above or by means of struts or brackets to the construction below or to the side.
4. Before drilling any concrete for attachments, installer shall carefully check concrete drawings and shop drawings and shall locate drilled holes to avoid reinforcing by at least 1 inch.
5. Hangers shall be installed in accordance with the HANGER AND ROD SCHEDULE.

**HANGER AND ROD SCHEDULE**

Nominal Pipe Diameter (Inches)	Steel Pipe Spacing (Feet)	Rod Size (Inches)	CPVC Pipe Spacing (Feet)	Rod Size (Inches)
1/2	5	3/8	5	3/8
3/4	6	3/8	5'-6"	3/8
1	7	3/8	6	3/8
1 ¼	8	3/8	6'-6"	3/8
1 ½	10	3/8	7	3/8
2	10	3/8	8	3/8
2 ½ and 3	10	1/2	9-10	3/8
4 and 5	10	5/8	NA	NA
6	10	3/4	NA	NA
8, 10, and 12	10	7/8	NA	NA

**HANGER AND ROD SCHEDULE NOTES**

Where unusual, concentrated loads of valves and fittings occur, closer spacing shall be required. Submit specific cases for review and comment.

Where piping changes direction, supports shall be placed in each direction adjacent to joints and no more than 12-inches from the joint.

Piping larger than 16-inches shall be supported according to the details on the drawings.

- R. Where more than one piping system material is specified, install compatible system components and joints. Install flanges, union, and couplings at locations requiring servicing.

- S. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil, or other non-toxic joint compound applied to male threads only.
- T. All components of the hanger system shall UL listed, and FM approved for use in fire protection systems.
- U. All hangers shall comply with the requirements of NFPA 13, The Standard for the Installation of Automatic Sprinkler Systems.
- V. Provide all steel required for support of pipes and equipment other than steel shown on Structural Engineer's drawings.
- W. All hanger materials including clevis hangers, rods, inserts, clamps, stanchions, brackets, shall have a factory applied finish of electro-plated zinc, unless noted otherwise.
- X. Hangers, clamps and supports for use on un-insulated copper piping shall be provided with inserts to isolate the copper piping from the hanger. Inserts shall be made of felt or plastic and shall be as manufactured by the hanger manufacturer.
- Y. Manufacturers:
  - 1. B-Line Systems, Inc.
  - 2. Carpenter & Paterson Inc.
  - 3. ERICO/Michigan Hanger Co.
  - 4. Globe Pipe Hanger Products Inc.
  - 5. Grinnell Corp.
  - 6. Tolco Inc.
  - 7. Unistrut Corp.; Tyco International, Ltd.
- Z. Hanger Materials:
  - 1. Horizontal Fire Protection Piping:
    - a. 2-inch and smaller:
      - 1) B-Line B3100.
      - 2) Grinnell 260.
      - 3) PHD 450.
    - b. 2-1/2 inch and larger:
      - 1) B-Line B3100.
      - 2) Grinnell 260.
      - 3) PHD 450.
  - 2. Vertical Piping (Riser Clamps):
    - a. Steel Pipe:
      - 1) B-Line B3373.
      - 2) Grinnell 261.
      - 3) PHD 550.
  - 3. Connectors:
    - a. Beam Clamps:
      - 1) B-Line B3033, B3050, B3291-B3297.
      - 2) Grinnell 88, 133, 134 or 292S.

- 3) PHD 360, 620.
- b. Concrete inserts:
  - 1) B-Line B2500, B3014.
  - 2) Grinnell 282, 285.
  - 3) PHD 950.
- c. Welded beam attachments:
  - 1) B-Line B3083.
  - 2) Grinnell 66.
  - 3) PHD 900.
- d. Piping adjacent to walls or steel columns, brackets:
  - 1) B-Line
  - 2) Grinnell
  - 3) PHD
- e. Base supports:
  - 1) B-Line
  - 2) Grinnell
  - 3) PHD
- 4. Hanger Rods:
  - a. Hanger rod:
    - 1) B-Line
    - 2) Grinnell
    - 3) PHD
  - b. Continuous threaded rod:
    - 1) B-Line
    - 2) Grinnell
    - 3) PHD
  - c. Eye Rods:
    - 1) B-Line
    - 2) Grinnell
    - 3) PHD

## 2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

## 2.3 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.4 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counter flashing: 22 gage thick galvanized steel.

- C. Lead Flashing:
  - 1. Waterproofing: 5 lb./sq. ft sheet lead.
  - 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16-gage at fire resistant elements.

## **2.5 MECHANICAL SLEEVE SEALS**

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. Thunderline/Link-Seal.
  - 2. Sealing Elements: Fire resistive silicone rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.6 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- E. Under-deck Clamp: Clamping ring with set screws.

## **2.7 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**



- A. All materials, equipment and accessories specified in this section shall be installed in strict accordance with NFPA 13, North Carolina Department of Insurance and the manufacturers' recommendations.

### **3.2 EXAMINATION**

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive fire-stopping.

### **3.3 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Obtain permission from the Professional before using powder-actuated anchors.
- E. Do not drill or cut structural members.

### **3.4 INSTALLATION – INSERTS**

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4-inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

### **3.5 INSTALLATION – PIPE HANGERS AND SUPPORTS**

- A. The Contractor shall furnish and install all supports, hangers, inserts and fasteners for the items incidental to the work in the construction of the project. Supports and hangers shall be provided to suit specific conditions for the type of construction. The method adopted shall be subject to the approval of the Professional.
- B. Supports shall secure pipes in place; prevent swaying and vibration; maintain required grading; provide free expansion and shall have a neat appearance. Supports shall be selected for strength and service and installed in a manner, which will not stress building construction. A five (5) to one (1) safety factor relative to the gross weight of piping system including fluid shall be used in the selection of the supports.
- C. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Only use inserts for suspending hangers from concrete slabs. Use beam clamps for suspending hangers from building steel. Do not hang one pipe from another. Do not use perforated band iron, wire or chain as hangers. Do not use vertical expansion shields. Do not hang from joist bridging.
- D. Fastenings installed in masonry walls shall be galvanized u-bolts set in the construction during erection.
- E. All vertical piping shall be supported at each floor level. Riser clamps at exposed locations shall be of such design as to avoid creating a hazardous or unsightly condition and stay within space limitations. Pipe supports are required at the base of all vertical risers and shall be of riser size.
- F. Where hanger rods are longer than 18-inches, provide lateral bracing at every fourth hanger. Do not support piping by wire, rope wood or other makeshift device. Provide additional steel

supports where building construction does not permit the hanger spacing as specified in the schedules. Location and details shall be submitted to the Professional for review.

- G. Where loading exceeds the safe allowable limit for any single insert, then multiple inserts shall be installed spaced no less than 12-inches on centers. The multiple inserts shall be connected with suitable size steel angles and locking bolts.
- H. Where fastenings are required in steel stud, wire lath or other non-masonry construction, a "J" hook and holding lock washer and nut shall be used which shall fasten to the opposite stud edge to which the item will abut. If the location of the fastening is not a steel stud, a structural steel shape shall be fastened to the wall with bolt and holding nut, with the fastening extension through the wall. The use of toggle bolts will not be permitted.
- I. Steel frame Construct:
  - 1. Support piping systems, devices, and equipment from structural steel members or secondary fabricated supports. Hanging from corrugated metal deck is prohibited.
  - 2. Where metal tabs integral with the metal deck are provided, support of piping, ductwork, devices and equipment from system to the maximum of the equivalent of a 10-foot length of 4- inch diameter, Schedule 40 section of pipe filled with water, or 6-inch diameter cast iron drainage pipe. Where tabs projecting down from the metal deck system are not available, inserts for concrete deck construction shall be installed. Inserts in poured concrete slabs shall be iron, fabricated galvanized iron or steel of the type to receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one horizontal direction.
- J. Reinforced Concrete Construction:
  - 1. Where concrete members support concrete roof or floor construction, support piping systems, devices, and equipment from roof to floor construction by use of concrete slab inserts.
  - 2. Inserts in poured concrete slabs shall be iron or fabricated galvanized iron or steel of the type to receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one (1) horizontal direction. Inserts shall be accurately located before the concrete is poured.
  - 3. Piping shall be adequately supported either by suspension from the construction above or by means of struts or brackets to the construction below or to the side.
  - 4. Before drilling any concrete for attachments, installer shall carefully check concrete drawings and shop drawings and shall locate drilled holes to avoid reinforcing by at least 1-inch. Before drilling any concrete for attachments, installer shall carefully check concrete drawings and shop drawings and shall locate drilled holes to avoid reinforcing by at least 1-inch.
  - 5. Hangers shall be installed in accordance with the HANGER AND ROD SCHEDULE. (See SCHEDULES below).

### **3.6 INSTALLATION – EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete, minimum 3½-inches thick and extending 6-inches beyond supported equipment. Refer to Division 03.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members, formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed. Refer to Section 21 0549.

**3.7 INSTALLATION – FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

**3.8 INSTALLATION – SLEEVES**

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1½-inches above finished floor level. Caulk sleeves. Extend sleeves through floors 3-inches above finished floor level in Kitchen or wet-areas.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire-stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel or stainless-steel escutcheons at finished surfaces.

**3.9 INSTALLATION – FIRE STOPPING**

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items, requiring fire-stopping.
- B. Apply primer where recommended by manufacturer for type of fire-stopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply fire-stopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- F. Place intumescent coating in sufficient coats to achieve rating required.
- G. Remove dam material after fire-stopping material has cured.
- H. Fire Rated Surface:
  - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1-inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
- I. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof openings as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1-inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
    - c. Install type of fire-stopping material recommended by manufacturer.

2. Install escutcheons, floor plates, or ceiling plates where exposed piping penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at computer rooms, electrical panel rooms, telecommunication rooms, and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

**3.10 FIELD QUALITY CONTROL**

- A. Division 01 - Quality Requirements or Division 01 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed fire-stopping for compliance with specifications and submitted schedule.

**3.11 CLEANING**

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of fire-stopping materials.

**3.12 PROTECTION OF FINISHED WORK**

- A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**3.13 HANGER AND ROD SCHEDULE NOTES**

- A. Where unusual, concentrated loads of valves and fittings occur, closer spacing shall be required. Submit specific cases for review and comment.
- B. Where piping changes direction, supports shall be placed in each direction adjacent to joints and no more than 12-inches from the joint.
- C. Piping larger than 16-inches shall be supported according to the details on the drawings.

**END OF SECTION 21 1104**

**SECTION 21 2313**  
**WET-PIPE SPRINKLER SYSTEMS**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.

**1.2 SUMMARY**

- A. Drawings and general provisions of the contract documents including General and Supplementary Conditions and Division 00 and 01 Specification sections apply to all work in this section.
- B. The General Conditions shall be carefully examined before proposals for any work are submitted. Division 21 shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions unless Division 21 specifications contain statements more definitive or more restrictive.
- C. Section includes wet-pipe sprinkler system, system design, installation, and certification.
- D. Related Sections:
  - 1. Section 21 0503 - Electrical Work for Fire Protection Systems: Execution requirements for electric connections to equipment specified by this section.

**1.3 REFERENCES**

- A. Refer to Section 21 0501 for complete listing of references.

**1.4 SYSTEM DESCRIPTION**

- A. System to provide coverage for the entire building as noted.
- B. Provide hydraulically designed system to NFPA 13 Ordinary Hazard, Group 1 occupancy requirements unless otherwise noted on the drawings.
- C. The Contractor shall obtain flow test data for the design of the hydraulic calculations. Design shall be based on flow test data and submitted to the Professional with the hydraulic calculations.
- D. Interface system with the building fire and smoke alarm system.
- E. Provide fire department connections as indicated on Drawings.

**1.5 SUBMITTALS**

- A. All submittals shall be reviewed and accepted by the General Contractor and prior to submittal to the Professional.
  - 1. The Specifying Engineer (PE) has primary responsibility for review and approval of fire suppression system shop drawings and hydraulic calculations. Specifying Engineer shall review and determine compliance with applicable codes and standards and the project contract documentation. After completing this review, the Engineer sends one (1) copy with a signed cover letter, including printed reviewer name, summarizing the outcome to the State Construction Office for approval.
- B. Section 21 0502 - Fire Protection Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- C. Shop Drawings: Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation. Indicate detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.

- D. Product Data: Submit data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- E. Design Data: Submit design calculations; signed and sealed by a Professional Engineer.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.6 CLOSEOUT SUBMITTALS**

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- C. Operation and Maintenance Data: Submit components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

**1.7 QUALITY ASSURANCE**

- A. Perform Work in accordance with NFPA 13, State, Federal, local code and the Authority Having Jurisdiction.
- B. Maintain one (1) copy of each document on site.

**1.8 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- C. Design system under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of North Carolina.

**1.9 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

**1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Store products in shipping containers until installation.
- C. Furnish piping with temporary inlet and outlet caps until installation.

**1.11 WARRANTY**

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

**1.12 EXTRA MATERIALS**

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish extra sprinklers under provisions of NFPA 13.
- C. Furnish suitable wrenches for each sprinkler type.
- D. Furnish metal sprinkler head storage cabinet(s) in location designated by the Owner.

**PART 2 - PRODUCTS**

**2.1 LISTING / APPROVAL**

- A. All sprinkler system materials and components must be UL Listed and FM Approved and used in strict conformance to the conditions of their Listing or Approval.

- B. All sprinklers shall be quick response type.
- C. Recessed pendant sprinkler head escutcheons shall be listed.
- D. Freezers with wet systems shall have dry pendant heads. The drops shall extend at least 12-inches above the freezer and be provided with insulating wrap to prevent sweating.
- E. Suspended Ceiling: Semi-recessed, pendant type with matching push-on escutcheon trim, chrome finish with glass bulb type or fusible link. Temperature rating of sprinkler head shall be suitable for specific area hazard.
- F. Exposed Areas: Standard upright type, brass finish with glass bulb type or fusible link. Temperature rating of sprinkler head shall be suitable for specific area hazard.
- G. Sidewall: Semi-recessed, quick response, chrome plated brass finished with glass bulb type or fusible link with matching push-on escutcheon trim. Temperature rating of sprinkler head shall be suitable for specific area hazard.

## 2.2 **SPRINKLERS**

- A. Manufacturers:
  - 1. Viking Corp.
  - 2. AFAC Inc.
  - 3. Central Sprinkler Corp.
  - 4. Firematic Sprinkler Devices, Inc.
  - 5. Globe Fire Sprinkler Corporation.
  - 6. Grinnell Fire Protection.
  - 7. Reliable Automatic Sprinkler Co., Inc.
  - 8. Star Sprinkler Inc.
  - 9. Venus Fire Protection, Ltd.
  - 10. Victaulic Co. of America.
- B. Suspended Ceiling Type:
  - 1. Type: Recessed, Semi-recessed and Concealed pendant type with matching push on escutcheon plate.
  - 2. Finish: Coordinate sprinkler and escutcheon finish and color with the Project Architect.
  - 3. Fusible Link: Fusible solder link type or Glass bulb type; temperature rated for specific area hazard.
- C. Exposed Area Type:
  - 1. Type: Standard upright type with guard where required.
  - 2. Finish: Brass.
  - 3. Fusible Link: Fusible-solder link type or Glass bulb type; temperature rated for specific area hazard.
- D. Side wall Type:
  - 1. Type: Standard horizontal side wall type with matching push on escutcheon plate.
  - 2. Finish: Coordinate sprinkler and escutcheon finish and color with the Project Architect.
  - 3. Fusible Link: Fusible-solder link type or Glass bulb type; temperature rated for specific area hazard.
- E. Sprinklers in Corrosive Environments (Natatorium, Pool Equip Rm, Chemical Storage, etc) – Upright, Pendent or Sidewall:

1. Provide wax coated or stainless steel sprinkler heads where exposed to acids, chemicals, or other corrosive fumes.

### **2.3 PIPING SPECIALTIES**

- A. Wet Pipe Sprinkler Alarm Valve: UL 193, 175-psig working pressure, designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, precision retarding chamber, and fill line attachment with strainer.
- B. Water Motor Alarm: UL 753, mechanical operation type, 10-inch diameter, cast-aluminum alarm gong, with red enamel factory finish. Include Pelton-wheel-type operator with nylon shaft bearings, and shaft length and sleeve to suit wall thickness and construction; ¾-inch inlet with strainer and 1-inch drain.
- C. Water Flow Switch: UL 346, electrical-supervision type, vane-type water-flow detector, rated to 250 psig, and designed for horizontal or vertical installation. Include two (2) SPDT (single-pole, double-throw) circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere, 125 volts AC. (7A, 125 VAC) and 0.25 ampere, 24 volts DC (0.25 A, 24 VDC); complete with factory-set, field-adjustable retard element to prevent false signals and tamper-proof cover that sends a signal when cover is removed.
- D. Fire Department Connections: UL 405, cast-brass body; NH-standard thread inlets according to NFPA 1963 and matching local fire department threads.
  1. Type: Exposed mounted wall type with chrome plated finish.
  2. Threaded NPS outlet.
  3. Inlets: Lugged swivel connections; drop-clappers for each hose connection with fire department thread size. Lugged and threaded dust-caps with gaskets and chain of matching material and finish.
  4. Drain: ¾-inch automatic drip, outside.
  5. Label: Round wall escutcheon plate with marking "AUTO SPKR./STANDPIPE" Matching material and finish.

### **2.4 PRESSURE GAGES**

- A. Pressure Gages: UL 393, 3½- to 4½-inches diameter dial with dial range of 0 - 250 psig.

### **2.5 ELECTRICAL CHARACTERISTICS AND COMPONENTS**

- A. Electrical Characteristics: In accordance with Division 26 and Section 21 0503.
- B. Controls: Supervisory switches, Flow Switches, Pressure Switches.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with NFPA 13.
- B. Install approved reduced pressure principle back-flow preventer assembly at sprinkler system water source connection.
- C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
- D. Locate outside alarm-gong on building wall as indicated on Drawings.
- E. Place pipe runs to minimize obstruction to other work.
- F. All piping in finished areas shall be run concealed. The Contractor shall furr in piping or provide soffit as required and in accordance with the Professional's instructions. All piping shall be



installed as required to suit space available in building structure, above suspended ceilings, and other locations found necessary for installation. Install piping as high as possible.

- G. The Contractor shall not install any piping that will interfere with any lights, openings, doors, windows, ductwork, equipment, and existing or special conditions. Headroom in front of openings, doors, or windows shall not be less than the top of the opening. Provide all piping offsets necessary to avoid interferences with other work. Piping offsets shall include all devices and assemblies necessary to accommodate the change in direction of the piping.
- H. All piping shall run straight with no more couplings and joints than necessary and shall be carefully installed to provide for proper alignment and slope.
- I. All piping shall be installed with not less than 2-inches between piping and all other work or piping.
- J. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted.
- K. Piping shall be properly arranged and graded to low points where the entire system can be emptied through a drain.
- L. Drain valves shall be provided to drain all sections of the piping system.
- M. Automatic sprinklers in the finished ceilings shall be located in accordance with the criteria defined in NFPA 13. These heads locations shall be reviewed and approved by the Project Architect before the contractor begins his hydraulic calculations.
- N. Install guards on sprinklers where required by NFPA 13.
- O. Hydrostatically test entire system.
- P. Require test be witnessed by Fire Marshal, State Construction Office Representatives, Owner, and Architect/Engineer.

### **3.2 ELECTRICAL SUPERVISION**

- A. Electrical supervision shall be provided for all sprinkler control valves, including the outside Post Indicator Valve or Wall-type Indicator Valve, EXCEPT that normally closed valves to test headers, hose connections on the roof, etc, shall only be provided with locks.

### **3.3 INSTALLATION, TEST, AND CERTIFICATION**

- A. All sprinkler valves and controls shall be located for safe and convenient access during emergencies and testing. Control valves shall not be located above ceilings. Inspector's Test Connections should be operable from floor level.
- B. Identify each valve and control with a prominent engraved phenolic or stamped metal placard. Any such devices which are behind access doors or panels must also have an appropriate placard on the means of access.
- C. Provide an auxiliary drain for each location where the piping pitch prevents complete drainage through the main drain valve. If the capacity of the trapped section exceeds five (5) gallons, a valve must be provided, and the outlet piped to a drain or convenient location acceptable to the Authority Having Jurisdiction.

### **3.4 INTERFACE WITH OTHER PRODUCTS**

- A. Verify signal devices are installed and connected to fire alarm system.
- B. Each retard shall be tested and adjusted for a 20 to 40 second delay.
- C. Electrical supervision shall be provided for all sprinkler control valves, including the outside Post Indicator Valve or Wall-type Indicator Valve, EXCEPT that normally closed valves to test headers, hose connections on the roof, etc., shall only be provided with locks. All sprinkler, flow and tamper switches shall be furnished and installed by this contractor and wired by Division 26.

### **3.5 CONTACTOR'S INSPECTION OF SYSTEM**

- A. The Contractor shall thoroughly inspect the completed system to assure compliance with this document, project plans and specs, and all applicable Codes and Standards. This must include an operational test of each water flow alarm switch and all system supervisory devices (valve tamper, hi-low air pressure, fire pump status, etc, where provided). This testing shall be performed in coordination with the fire alarm system contractor.
- B. At the final inspection, the fire sprinkler contractor should have for review and closeout documentation all pertinent NFPA paperwork properly filled out on NFPA forms as applicable (NFPA 13, 14, 20, 24). The shop drawing approval letter from this office should be available. A set of as-built fire sprinkler shop drawings and hydraulic calculations shall be placed in a white PVC tube marked "Fire Sprinkler Shop Drawings" and securely fixed in the fire sprinkler riser room.

### **3.6 CONTACTOR'S MATERIAL AND TEST CERTIFICATES**

- A. Prior to requesting the Professional to set up the final inspection, complete and submit copies of the MATERIAL AND TEST CERTIFICATES to the following:
  - 1. Professional.
  - 2. Owner.
  - 3. NCDOT – State Property Insurance Fund Division.

### **3.7 CLEANING**

- A. Division 01 - Execution and Closeout Requirements: Final cleaning.
- B. Flush entire piping system of foreign matter.

### **3.8 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Division 01 - Execution and Closeout Requirements: Protecting installed construction.
- B. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting.
- C. Replace inadvertently painted sprinklers with new.

**END OF SECTION 21 2313**

**SECTION 22 0501**  
**COMMON WORK RESULTS FOR PLUMBING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Drawings and general provisions of the contract documents including General and Supplementary Conditions and Division 00 and 01 Specification sections apply to all work in this section.
- B. The General Conditions shall be carefully examined before proposals for any work are submitted. Division 22 shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions unless Division 22 specifications contain statements more definitive or more restrictive.
- C. Nothing herein contained shall be so construed to relieve the Contractor from doing his work according to the true intent and meaning of these drawings and specifications. He will be held to provide and install all materials and equipment and shall furnish all labor necessary for the complete, prompt, and satisfactory execution of the work. He is also responsible for the proper coordination of his work with all other trades.
- D. The Contractor shall bear all expenses incidental to the satisfactory completion of the work contained in these specifications and drawings.

**1.2 SCOPE**

- A. Perform work and provide material and equipment as shown on Drawings and/or as specified and/or indicated in this Section of the Specifications. Completely coordinate work of Divisions 22 with work of other trades and provide a complete and fully functional installation.
- B. Drawings and Specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices, and materials obviously necessary for a sound, secure and complete installation.
- C. It is the intent that these Specifications and Drawings are to establish minimum requirements for methods, products, and equipment and to provide electrical service, distribution and systems finished, tested and ready for operation. Incidental detail not usually shown or specified, but necessary for proper installation and operation shall be included in the work and this Contractor's estimate, the same as if specified. Locations of all equipment and material shall be adjusted at no extra cost to the Owner, to accommodate the work interferences anticipated and/or encountered. Prior to installation, determine the exact route and location of each raceway and piece of equipment to minimize conflicts with other trades.
- D. Give notices, file plans, obtain permits and licenses, pay fees and back-charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
- E. Division 22 Contractor shall furnish all motor starters and disconnect switches as required by NEC for equipment motors, unless specifically noted otherwise in the specifications or on the drawings. Motor starters and disconnect switches shall be in accordance with Division 26 Specifications.
- F. If a Guaranteed Maximum Price (GMP) has been prepared using documents prior to the issuance of the ISSUED FOR CONSTRUCTION, the Contractor shall identify any and all changes to the documents (both drawings and specifications) that are affecting the GMP, either increasing or

decreasing the GMP amount. All changes shall be numbered and circled, in both drawings and specifications. The Contractor shall also provide detailed cost back-up for all items noted above.

- G. Work consists of furnishing all labor, material, equipment, and services necessary and reasonably incidental to the proper completion and proper operation of the plumbing systems. The work shall consist of but shall not necessarily be limited to the following:
1. Domestic water system including extension of piping and connections to all equipment, fixtures, booster pumps, water heaters, and accessories. The Domestic water system shall be extended from **[a point five (5)-feet beyond the exterior face of the building] [the existing domestic water system] [a coordinated point of connection at a utility service flange within the building]**.
  2. Sanitary drain, waste and vent system including connection to all equipment, fixtures, and accessories. The sanitary system shall be extended to **[a point five (5)-feet beyond the exterior face of the building] [the existing sanitary system]**. Final installation at the point of connection shall be made.
  3. Rainwater collection system including extension of piping to **[roof drains] [existing drains and conductors]**. The rainwater collection system shall be extended to **[a point five (5)-feet beyond the exterior face of the building] [the existing rainwater collection system]**.
  4. Modifications to existing plumbing systems, equipment, fixtures, and accessories as indicated and as specified.
  5. Removal of plumbing systems, equipment, piping, etc., no longer required as a part of the revised installations.
  6. Piping and equipment insulation for existing systems and equipment **[which have been exposed due to an asbestos abatement program] [or] [; or, to remain and repair damaged coverings or as required completing continuous coverage]**.
  7. Domestic Water Systems as defined in the Contract Documents.
  8. General Service Compressed Air Systems as defined in the Contract Documents.
  9. High Purity Water System and Specialties as defined in the Contract Documents.
  10. Natural Gas Distribution Systems as defined in the Contract Documents.
  11. Sanitary drainage systems as defined in the Contract Documents.
  12. Storm Water Collection Systems as defined in the Contract Documents.
  13. Chemical Waste Systems and Specialties as defined in the Contract Documents.
  14. Sump Pumps and Sewage Ejectors as defined in the Contract Documents.
  15. Plumbing Pumps as defined in the Contract Documents.
  16. Sanitary Waste Interceptors as defined in the Contract Documents.
  17. Domestic Water Heaters as defined in the Contract Documents.
  18. Plumbing Fixtures as defined in the Contract Documents.
  19. Laboratory Safety Device System as defined in the Contract Documents.
  20. Medical Gas and Vacuum Piping Systems as defined in the Contract Documents.
  21. Medical Gas and Vacuum Source Equipment as defined in the Contract Documents.
  22. Emergency Generator Fuel Oil Supply Piping as defined in the Contract Documents.
  23. Emergency Generator Exhaust Piping as defined in the Contract Documents.

- H. The General Conditions shall be carefully examined before proposals for any work are submitted. Division 22 shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions unless Division 22 specifications contain statements more definitive or more restrictive.
- I. Nothing herein shall be so construed to relieve the Contractor from doing his work according to the true intent and meaning of the drawings and specifications. He will be held to provide and install all materials and equipment, and shall furnish all labor necessary for the complete, prompt and satisfactory execution of the work. Also, he is responsible for properly coordinating his work with all other trades.
- J. The contractor shall bear all expenses incidental to the satisfactory completion of the work contained in these specifications and drawings.
- K. Related Sections:
  - 1. Division 03 - Concrete Forming and Accessories: Execution requirements for inserts and sleeves specified by this section.
  - 2. Division 07 - Firestopping: Execution and material requirements for fire proofing of penetrations of rated construction.
  - 3. Division 09 - Painting and Coating: Execution requirements for piping painting specified by this section.

### **1.3 DEFINITIONS AS USED IN THESE SPECIFICATIONS**

- A. "Provide," means "furnish and install".
- B. "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support".
- C. "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
- D. "Architect" means the "Prime Design Consultant," and if McKim & Creed is not the prime design consultant, the Architect may authorize McKim & Creed to act on the Architect's behalf in matters concerning the Division 22 series of specifications.
- E. "RFI" means Contractor's "Request for Information".
- F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- G. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- H. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- I. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- J. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- K. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 2. CPVC: Chlorinated polyvinyl chloride plastic.
  - 3. PE: Polyethylene plastic.

4. PP: Polypropylene plastic.
  5. PVC: Polyvinyl chloride plastic.
- L. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  2. NBR: Acrylonitrile-butadiene rubber.

#### **1.4 CONTRACT DOCUMENTS**

- A. Listing of Drawings does not limit responsibility of determining full extent of work required by these Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, Site Utility and all other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of Divisions 22 must be coordinated.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.
- F. Data that may be furnished electronically by the Architect (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Architect's sealed or stamped construction documents.

#### **1.5 DISCREPANCIES IN DOCUMENTS**

- A. Where Drawings or Specifications conflict or are ambiguous, the contractor shall advise the Architect in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Architect in writing before installation. Otherwise, make changes in installed work as Architect requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specifications, this contractor shall provide that material, installation, or work which is of the higher, more stringent standard.
- D. The Contract Documents require the Contractor to provide systems and components that are fully complete, operational, and suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component or its coordination with other building elements. In

cases such as this, where the Contractor has failed to notify the Architect of the situation in accordance with Paragraph (A) above, the Contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

- E. In cases covered by Paragraph (D) above, where the Contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Architect shall review and advise the contractor of the disposition.

#### **1.6 MODIFICATIONS IN LAYOUT**

- A. Plumbing Drawings are diagrammatic. They indicate general arrangements of plumbing systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. In order to obtain the Architect's desired aesthetics in spaces used by building occupants, in all such spaces, prior to installation of visible material and equipment (including access panels) review Architectural Drawings for desired locations and where not definitely indicated, request information from Architect.
- C. Check Contract Documents, as well as Submittals and Shop Drawings of all subcontractors to verify and coordinate spaces in which work of Division 22 will be installed.
- D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C and D above. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

#### **1.7 REQUESTS FOR INFORMATION (RFI)**

- A. If the RFI is a request to resolve a conflict or an ambiguity, or a request for additional detail, Contractor's RFI shall include a sketch or equivalent description of Contractor's proposed solution, in accordance with paragraphs 1.5 (E) and 1.6 (F) above.
- B. To expedite the flow of RFI's, for all RFI's under Divisions 22, Contractor shall submit the attached form, or similar form including the same information, to the Architect, with copy to United Engineering Group. Contractor shall include proposed solution in the indicated space on the form.

#### **1.8 REFERENCES**

- A. The Contractor shall comply with all laws, ordinances, and regulations of all authorities having jurisdiction, including those of all applicable city, county, state, federal and public utility entities. The Contractor shall obtain all licenses, permits, etc. and shall pay all associated connection fees, tapping fees, inspection fees, etc. This cost shall be included in the contract price.
- B. The publications listed below form a part of this specification. All publications shall be the latest edition with Amendments as adopted by the authority having jurisdiction. The minimum standard of work under this contract shall be in accordance with the following model building codes:
  - 1. North Carolina State Building Code:
    - a. Building, 2009 edition.
    - b. Plumbing, 2009 edition.
    - c. Mechanical, 2009 edition.

- d. National Electric Code, 2011 edition.
  - e. Fire Prevention, 2009 edition.
  - f. Fuel Gas, 2009 edition.
  - g. Energy Conservation Code, 2009 edition.
- C. The minimum design and construction parameters of the work shall be in accordance with the following standards:
- 1. AABC - National Standards for Total System Balance.
  - 2. Air-Conditioning and Refrigeration Institute:
    - a. ARI 575 - Method of Measuring Machinery Sound within Equipment Space.
    - b. ARI 1010 - Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
  - 3. American Bearing Manufacturers Association:
    - a. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
  - 4. American National Standards Institute:
    - a. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
    - b. ANSI S1.4 - Sound Level Meters.
    - c. ANSI S1.8 - Reference Quantities for Acoustical Levels.
    - d. ANSI S12.36 - Survey Methods for the Determination of Sound Power Levels of Noise Sources.
    - e. ANSI Z21.10.1 - Gas Water Heaters Vol. I Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less.
    - f. ANSI Z21.10.3 - Gas Water Heaters - Vol. III Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.
    - g. ANSI Z21.15 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
    - h. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.
    - i. ANSI Z124.1 - Plastic Bathtub Units.
    - j. ANSI Z124.2 - Plastic Shower Units.
    - k. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.
  - 5. American Society of Mechanical Engineers:
    - a. ASME A13.1 - Scheme for the Identification of Piping Systems.
    - b. ASME A112.6.1 - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
    - c. ASME A112.14.1 - Backwater Valves.
    - d. ASME A112.14.3 - Grease Interceptors.
    - e. ASME A112.14.4 - Grease Removal Devices.
    - f. ASME A112.18.1 - Plumbing Fixture Fittings.
    - g. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
    - h. ASME A112.19.2M - Vitreous China Plumbing Fixtures.
    - i. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).



- j. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
  - k. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.
  - l. ASME A112.21.1 - Floor Drains.
  - m. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
  - n. ASME B16.3 - Malleable Iron Threaded Fittings.
  - o. ASME B16.4 - Gray Iron Threaded Fittings.
  - p. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - q. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - r. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
  - s. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV.
  - t. ASME B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psig (sizes 1/2 – 2).
  - u. ASME B31.1 - Power Piping.
  - v. ASME B31.5 - Refrigeration Piping.
  - w. ASME B31.9 - Building Services Piping.
  - x. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
  - y. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
  - z. ASME PTC 25 - Pressure Relief Devices.
  - aa. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
  - bb. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
6. American Society of Sanitary Engineering:
- a. ASSE 1010 - Performance Requirements for Water Hammer Arresters.
  - b. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
  - c. ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
  - d. ASSE 1013 - Performance Requirements for Reduced Pressure Principal Backflow Preventers and Reduced Pressure Fire Protection Principal Backflow Preventers.
  - e. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
  - f. ASSE 5013 - Performance Requirements for Reduced Pressure Principal Backflow Preventers (RP) and Reduced Pressure Fire Protection Principal Backflow Preventers (RFP).
7. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
- a. ASHRAE Handbook - HVAC Applications.
  - b. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
  - c. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
8. ASTM International:

- a. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
- b. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- c. ASTM A74-09 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- d. ASTM A135/A135M-06 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
- e. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- f. ASTM A234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- g. ASTM A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
- h. ASTM A536 - Standard Specification for Ductile Iron Castings.
- i. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
- j. ASTM A795/A795M-08 - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- k. ASTM B32 - Standard Specification for Solder Metal.
- l. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- m. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
- n. ASTM B75 - Standard Specification for Seamless Copper Tube.
- o. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- p. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- q. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- r. ASTM B302 - Standard Specification for Threadless Copper Pipe.
- s. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
- t. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
- u. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- v. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- w. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- x. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- y. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- z. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- aa. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

- bb. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- cc. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- dd. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- ee. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
- ff. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
- gg. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- hh. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- ii. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- jj. ASTM C1126 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
- kk. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor.
- ll. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- mm. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- nn. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- oo. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameters.
- pp. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- qq. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- rr. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ss. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- tt. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- uu. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- vv. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
- ww. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
- xx. ASTM D2662 - Standard Specification for Polybutylene (PB) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

- yy. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- zz. ASTM D2666 - Standard Specification for Polybutylene (PB) Plastic Tubing.
- aaa. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- bbb. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- ccc. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
- ddd. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- eee. ASTM D3000 - Standard Specification for Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- fff. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- ggg. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- hhh. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- iii. ASTM D3262 - Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- jjj. ASTM D3309 - Standard Specification for Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems.
- kkk. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.
- lll. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.
- mmm. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Non-pressure Applications.
- nnn. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.
- ooo. ASTM E1 - Standard Specification for ASTM Thermometers.
- ppp. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.
- qqq. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- rrr. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- sss. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
- ttt. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
- uuu. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- vvv. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- www. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

- xxx. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
  - yyy. ASTM F441/F441M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
  - zzz. ASTM F442/F442M - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
  - aaaa. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - bbbb. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
  - cccc. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core.
  - dddd. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
  - eeee. ASTM F845 - Standard Specification for Plastic Insert Fittings for Polybutylene (PB) Tubing.
  - ffff. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.
  - gggg. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.
  - hhhh. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
9. American Welding Society:
- a. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  - b. AWS D1.1 - Structural Welding Code – Steel.
  - c. AWS D1.2 - Structural Welding Code—Aluminum.
  - d. AWS D1.4 - Structural Welding Code--Reinforcing Steel.
10. American Water Works Association:
- a. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - b. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - c. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3-inches. through 48-inches, for Water and Other Liquids.
  - d. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - e. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - f. AWWA C651 - Disinfecting Water Mains.
  - g. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
  - h. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
  - i. AWWA C702 - Cold-Water Meters - Compound Type.
  - j. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.

- k. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
  - l. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
  - m. AWWA C950 - Fiberglass Pressure Pipe.
  - n. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
11. Cast Iron Soil Pipe Institute:
- a. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
  - b. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
12. FM Global:
- a. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
13. International Electrical Testing Association:
- a. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
14. Intertek Testing Services (Warnock Hersey Listed):
- a. WH - Certification Listings.
15. Manufacturers Standardization Society of the Valve and Fittings Industry:
- a. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - b. MSS SP 67 - Butterfly Valves.
  - c. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - d. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
  - e. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - f. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
  - g. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
  - h. MSS SP 85 - Cast Iron Globe & Angle Valves, Flanged and Threaded.
  - i. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
  - j. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
16. National Electrical Manufacturers Association:
- a. NEMA MG 1 - Motors and Generators.
  - b. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
17. National Fire Protection Association:
- a. NFPA 31 - Standard for the Installation of Oil-Burning Equipment.
  - b. NFPA 54 - National Fuel Gas Code.
  - c. NFPA 58 - Liquefied Petroleum Gas Code.
  - d. NFPA 70 - National Electrical Code.
  - e. NFPA 72 - National Fire Alarm Code.

- f. NFPA 99 - Standard for Health Care Facilities.
- 18. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- 19. Plumbing and Drainage Institute:
  - a. PDI WH201 - Water Hammer Arrester Standard.
- 20. Underwriter Laboratories, Inc.:
  - a. UL 263 - Fire Tests of Building Construction and Materials.
  - b. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - c. UL 842 - Valves for Flammable Fluids.
  - d. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - e. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - f. UL - Fire Resistance Directory.
- 21. United States Department of Energy:
  - a. DOE 10 CFR - Uniform Test Method for Measuring the Energy Consumption of Furnaces.

#### **1.9 SUBMITTALS**

- A. Section 22 0502 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- B. The Contractor shall submit Certificates of Compliance for the following:
  - 1. Schedule of UL listed through penetration assemblies.

#### **1.10 ELECTRICAL EQUIPMENT**

- A. Refer to Section 22 0503 of this manual for the requirements relating to electrical equipment.

#### **1.11 CONTROL WIRING**

- A. Refer to Section 22 0503 of this manual for the requirements relating to wiring.

#### **1.12 QUALITY ASSURANCE**

- A. The Contractor shall coordinate his work with that of the other trades. Where interference with other trades occurs, the Contractor shall present his solutions to the Professional. The Professional shall make the final decision regarding changes to be made in the work.
- B. The Contractor shall thoroughly familiarize himself with all specifications and drawings for the project so that he clearly understands his responsibility in relationship to the work to be performed. The Contractor shall plan and perform his work so as to permit the use of the building at the earliest possible date.
- C. The Contractor shall guarantee all work, materials and equipment, furnished against defects, leaks, performance and non-operation for a period of one (1) year after the date of the Owner's final acceptance. Defects shall be interpreted as defective materials or equipment or unsatisfactory installation and are not intended to apply to ordinary wear and tear. The Contractor shall pay for any repairs or replacements caused by these defects within the period covered by the guarantee, including all incidental work required to correct the deficiency.
- D. The Contractor shall expressly and completely follow all manufacturers' instructions required for validation of the manufacturer's warranty agreement including but not limited to service, maintenance, and adjustments of the equipment.
- E. The Contractor is responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the contract documents.

- F. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code—Steel".
- G. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping".
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- H. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### 1.13 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and tag numbering.
  - 1. Changes from the contract drawings necessary to coordinate the work with other trades, to conform to the building conditions or to conform to the rules and regulations of authorities having jurisdiction shall be made only after obtaining written permission from the Professional.
  - 2. The Contractor shall keep a record of construction changes and deviations from the original contract drawings. All changes shall be recorded on a separate set of prints, which shall be kept at the job site specifically for that purpose. The record shall be made immediately after the work is completed. Documentation shall include the following:
    - a. Location and elevation of new and existing utility lines.
    - b. Points of connection to existing utility lines.
    - c. Changes in pipe routing location.
    - d. Valve locations.
    - e. Equipment locations, etc.
    - f. Actual capacities and values of equipment provided as indicated in equipment schedules.
  - 3. The marked-up record set of drawings shall be delivered to the Professional before final acceptance of the fire protection contract work.
  - 4. Operation and Maintenance Data: Submit spare parts lists.

### 1.14 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code—Steel".
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping".
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.



- D. Maintain one copy of each document on site.

**1.15 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years' experience approved by manufacturer.

**1.16 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.
- C. The Contractor is responsible to verify the location of any and all existing underground utilities in the vicinity of his work. When it has been indicated that these utilities are to remain in place, the Contractor shall provide adequate means of support and protection during excavation operations.
- D. Before ordering any equipment and material, or performing any work, the Contractor shall verify all measurements and dimensions at the job site. The Contractor is responsible for the correctness of this information.
- E. No extra compensation will be considered based on differences between actual dimensions and measurements and those indicated on the drawings.
- F. Any differences identified by the Contractor shall be submitted to the Professional for consideration before proceeding with the work.

**1.17 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store valves in shipping containers, with labeling in place.
- C. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

**1.18 COORDINATION**

- A. The Contractor shall coordinate his work with that of the other trades. Where interference with other trades occurs, the Contractor shall present his solution to the Professional. The Professional shall make the final decision regarding changes to be made in the work.
- B. The Contractor shall thoroughly familiarize himself with all specifications and drawings for the project so that he clearly understands his responsibility in relationship to the work to be performed. The Contractor shall plan and perform his work so as to permit the use of the building at the earliest possible date.
- C. The Contractor shall guarantee all work, materials and equipment furnished against defects, leaks, performance and non-operation for a period of one (1) year after the date of the Owner's final acceptance, or as indicated in the General Conditions. Defects shall be interpreted as defective materials or equipment or unsatisfactory installation and are not intended to apply to ordinary wear and tear. The Contractor shall pay for any repairs or replacements caused by these defects within the period covered by the guarantee, including all incidental work required to correct the deficiency.
- D. The Contractor shall expressly and completely follow all manufacturers' instructions required for validation of the manufacturer's warranty agreement including but not limited to service, maintenance, and adjustments of the equipment.

- E. The Contractor is responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the contract documents.
- F. Prepare coordination drawings at a scale of 1/4" = 1'-0" or larger, detailing major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work. The Mechanical Contractor will administer the effort of coordination between various trades. The Plumbing Contractor will use the coordination drawings prepared by the Mechanical Contractor to show equipment and materials for coordination between trades. The coordination drawings will be prepared before installation of any plumbing, sprinkler, mechanical or electrical work and will be shown as a task on the Project Schedule to be prepared by the General Contractor.
- G. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 - Access Doors and Frames.
- H. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- I. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

#### **1.19 EXTRA MATERIALS**

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Refer to individual Division 22 Sections for specific materials and/or products.

### **PART 2 - PRODUCTS**

#### **2.1 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 22 Sections for pipe, tube, and fitting materials and joining methods.

#### **2.2 JOINING MATERIALS**

- A. Refer to individual Division 22 Sections for special joining materials not listed below.

#### **2.3 MECHANICAL SLEEVE SEALS**

- A. Refer to Section 22 1104.

#### **2.4 SLEEVES**

- A. Refer to Section 22 1104.

#### **2.5 ESCUTCHEONS**

- A. Refer to individual Division 22 Sections for material requirements.

#### **2.6 GROUT**

- A. Refer to individual Division 22 Sections for material requirements.

### **PART 3 - EXECUTION**

#### **3.1 PIPING SYSTEMS – COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following.
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece Split-casting One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - i. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - j. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    - k. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  - 2. Existing Piping: Use the following:
    - a. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
    - b. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with rough-brass finish.
    - c. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
    - d. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.

- e. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2-inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials.
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2-inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6-inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6-inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire-stop materials. Refer to Division 07 Section "Penetration Fire-stopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.2 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows.
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846 Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Non-pressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.
  - 7. Plastic Pressure Piping, Gasketed Joints: Join according to ASTM D 3139.
  - 8. Plastic Non-pressure Piping, Gasketed Joints: Join according to ASTM D 3212.
  - 9. Plastic-Piping Electrofusion Joints: Make polyolefin drainage-piping joints according to ASTM F 1290.

### **3.3 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2½ and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.4 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### **3.5 PAINTING**

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting".
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.6 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4-inches larger in both directions than supported unit.
  - 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 the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete".

### **3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

**3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

**3.9 GROUTING**

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION 22 0501**

## SECTION 22 0502

### PLUMBING SHOP DRAWINGS, SUBMITTALS, AND SUBSTITUTIONS

#### PART 1 - GENERAL

##### 1.1 GENERAL

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.
- B. All catalog data, shop drawings, calculations and certificates of compliance shall be submitted as a single package. Failure of the Contractor to provide a complete submittal package may result in delay in processing time. All such delays to the project resulting from the contractor's failure to provide submittals at one time will be the responsibility of the contractor.

##### 1.2 DEFINITIONS

- A. Shop Drawings: Project shop drawings and other data prepared specifically for fulfillment of the project requirements. Shop drawings include fabrication, layout, setting, installation, coordination and similar drawings and diagrams, and include performance data associated therewith, including weights, capacities, speeds, outputs, consumption, efficiencies, voltages, amperages, cycles, phases, noise levels, operating ranges, and similar information.
- B. Samples: Units of typical work, materials, or equipment items, showing the workmanship, pattern, trim and similar qualities proposed for the work to be provided, as designated.
- C. Manufacturer's Data: Product manufacturer's standard printed product information, including promotional brochures, product specifications, installation instructions and diagrams, statements of compliance with standard performance charts or curves, and similar information concerning the standard portions of the manufacturer's products.
- D. Test Reports: Specific reports prepared by independent testing laboratories and others, showing the results of specified testing on either the material/equipment provided or on identical material/equipment, and on installed electrical systems.
- E. Industry Standards: Printed copies of the current standards recognized in the industry. Current means the latest issue as of the date of these specifications, unless otherwise indicated; within the text of these specifications the date-suffix frequently shown with identification numbers has been omitted.
- F. Manufacturer's Product Warranties: Manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the Manufacturer, when and if the product fails within certain operational conditions and time limits.
- G. Operating Instructions: The written instructions by the manufacturers, fabricators, or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control and shutdown of each operating item of the equipment and each electrical system.
- H. Maintenance Manuals: The compiled information provided for the Owner that certain acts of restitution will be performed when and if certain portions of electrical work fail within certain operational conditions and time limits.

##### 1.3 SUBMITTAL FORMS AND PROCEDURES

- A. General: Comply with Division 1 requirements for identification, quantities processing, scheduling and similar general requirements, except as otherwise indicated. Submittals shall be complete, in one package, clearly identified and cross-referenced to the appropriate specification section defining the submitted item. Partial submissions will not be addressed. The Contractor is responsible for any delays caused by incomplete submittal packages.
- B. Submittal Tracking: The Contractor shall refer to 22 05 02 - Table A for a listing of the required submittals. The Schedule shall be included as part of his submission with those portions of the



- schedule for which he is responsible filled out. The Schedule will be used to track the submittal through the review process.
- C. Quantities: Provide quantities as listed in the General Conditions or as otherwise indicated in the Division 22 Specifications.
  - D. Presentation: Submittals shall be assembled in three ringed binders with each specification section separated by a tab on which the specification section is noted. The submittals shall be clearly marked indicating which specific item is being considered and all its related information. Submittals not complying with these requirements are subject to being returned without being reviewed.
  - E. Substitutions: Plumbing submittals are not opportunities for gaining acceptance of substitutions. Where three or more manufacturers are specified by name, or by catalog reference, Contractor shall select for use any of those so specified.
  - F. Should the Contractor desire to substitute another manufacturer's equipment for one specified by name, the contractor shall apply in writing at least ten (10) days prior to bid date for such permission. He shall provide supporting data and samples for Engineers consideration. No substitution shall be made for any material, article, or process required under the contract unless approved by the Engineer.
  - G. Any time that is required by the Engineer for a request to review submittals for substitute equipment after the award of bids will be billed to the contractor at the Engineers current hourly billing rate. The Engineers review time will be billed to the contractor whether the proposed substitution is accepted or rejected.
  - H. Operating Instructions: The written instructions by the manufacturer, fabricator, or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation.
  - I. Response to Submittals: Where standard product data have been submitted in fulfillment of project requirements, it is recognized that the submitter has already determined that the products fulfill the specified requirements, and that the submittals are for the Architects' or Engineers' information only but will be returned without action where observed to be non-complying with the requirements. Where uniquely prepared information is submitted, it is recognized to represent the preparer's interpretation or solution to the specified requirements, subject to the Architects', or Engineers' concurrence and appropriate action as indicated in Division 1.
  - J. Shop Drawings and Samples: After checking and verifying all field measurements, the Contractor shall submit to the Engineer for review, in accordance with the accepted schedule of shop drawings submissions, copies of all shop drawings, which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The data shown on the shop drawings shall be complete with respect to dimensions, design criteria, materials of construction and the like to enable the Engineer to review the information as required.
  - K. The Contractor shall also submit to the Engineer for review, with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers, and the use for which intended.
  - L. At the time of each submission, the Contractor shall in writing call the Engineer's attention to any deviations that the shop drawings or sample may have from the requirements of the Contract Documents.
  - M. No work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by the Engineer. A copy of each shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

- N. The Engineer's review of shop drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to such deviation at the time of submission and the Engineer has given written approval to the specific deviation, nor shall any review by the Engineer relieve the Contractor from responsibility for errors or omissions in the shop drawings.
- O. The Contractor's shop drawing stamp shall indicate that the shop drawings have been checked for conformity to the Contract Documents and appropriate means have been taken to ensure that the material and /or equipment will fit into the space available. Shop drawings will be returned without review if the submittals do not have the Contractor's stamp, or the submittals have not been reviewed by the Contractor.
- P. The Engineer's review of shop drawings is for general conformance with design concept only. The Contractor is responsible for all quantities, dimensions, and coordination of the work of all trades. Corrections or comments made on the shop drawing during this review do not relieve the contractor from compliance with requirements of the contract documents. The Contractor is responsible for selecting fabrication processes and techniques of construction and for performing all work in a safe and satisfactory manner.
- Q. The Contractor shall stamp the shop drawings and submittals and verify by his/her signature that the shop drawings and submittals have been checked for compliance with the contract documents.
- R. The Contractor shall provide TABLE A as a cover letter with the submittals. The "Date Submitted" column shall be filled in by the Contractor. The remaining three columns are for the Engineer's use.

#### **1.4 GENERAL SUBMITTAL REQUIREMENTS**

- A. Applicability: Wherever it is indicated that a shop drawing, sample, manufacturer's brochure, certification, test, copy of standard operating instruction, manual, extra stock, guarantee, or warranty is required, the appropriate submittal is required regardless of whether it is specified as a "submittal"; the Architects' or Engineers' decision shall be final.

#### **1.5 SUBSTITUTIONS**

- A. Substitutions: Plumbing submittals are not opportunities for gaining acceptance of substitutions. Where three or more manufacturers are specified by name, or by catalog reference, Contractor shall select for use any of those so specified.
- B. Should the Contractor desire to substitute another manufacturer's equipment for one specified by name, the Contractor shall apply in writing at least ten (10) days prior to bid date for such permission. He shall provide supporting data and samples for Engineers consideration. No substitution shall be made for any material, article, or process required under the contract unless approved by the Engineer.
- C. Any time that is required by the Engineer for a request to review submittals for substitute equipment after the award of bids will be billed to the Contractor at the Engineers current hourly billing rate. The Engineers review time will be billed to the Contractor whether the proposed substitution is accepted or rejected.

#### **1.6 OPERATION AND MAINTENANCE MANUALS**

- A. Submit two (2) sets of 8½" x 11" text sixty (60) days prior to operator training/pre-final inspection bound in three D side-ring capacity expansion binders with durable plastic covers for review by the Professional.
- B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on thirty (30) pound white paper.
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Professional, Contractor, Subcontractors, and equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions arranged by system or process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Maintenance instructions for equipment and systems.
    - e. Maintenance instructions for finishes, including recommended cleaning methods and materials and operating instructions.
    - f. Special precautions identifying detrimental agents.
    - g. Special Requirements of other sections of this specification noted to be included in the operating and maintenance manual.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. All approved Submittals.
    - b. Certificates of Compliance.
    - c. Photocopies of warranties and bonds.
    - d. Material safety data sheets.
- E. Submit five (5) copies of completed volumes in final form fifteen (15) days prior to owner training. These copies will include Professional's previous review comments.
- F. Submit eight final volumes revised, within ten (10) days after pre-final observation.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION 22 0502

**SECTION 22 0553**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.
- B. 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.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Nameplates.
  - 2. Valve Tags.
  - 3. Warning Tags.
  - 4. Stencils.
  - 5. Pipe markers.
  - 6. Ceiling markers.
- B. Related Sections:
  - 1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

**1.3 REFERENCES**

- A. Refer to Section 22 0501 for complete listing of references.

**1.4 SUBMITTALS**

- A. Section 22 0502 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Samples: Submit two (2) of each valve tag, label, pipe marker, and ceiling marker, size used on project.
- E. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.5 CLOSEOUT SUBMITTALS**

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

**1.6 QUALITY ASSURANCE**

- A. **[Conform to NFPA 99 requirements for labeling and identification of medical gas piping systems and accessories].**

- B. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.
- C. Maintain one copy of each document on site.

### **1.7 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

### **1.8 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one (1) week prior to commencing work of this section.

### **1.9 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

### **1.10 EXTRA MATERIALS**

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Manufacturers:
  1. Craftmark Identification Systems.
  2. Safety Sign Co.
  3. Seton Identification Products.
  4. Brady Worldwide.

### **2.2 EQUIPMENT NAMEPLATES**

- A. Product Description:
  1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
  2. Letter Color: White.
  3. Background Color: Black.
  4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  5. Minimum Label Size: Length and width vary for required label content, but not less than 2½ by ¾-inch.
  6. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24-inches, ½-inch for viewing distances up to 72-inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  7. Fasteners: Stainless-steel rivets or self-tapping screws.

### **2.3 VALVE TAGS**

- A. Plastic Tags:
  1. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½-inches in diameter or 1½-inches square.
  2. Fasteners: Brass beaded chain.
- B. Metal Tags:

1. Brass, Aluminum, or Stainless Steel with stamped letters; tag size minimum 1½-inches in diameter or 1½-inches square with finished edges and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

## 2.4 WARNING TAGS

- A. Information Tags:
1. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3¼ x 5-5/8-inches with grommet and self-locking nylon ties.

## 2.5 SCHEDULES

- A. Typewritten letter size list of applied labels, tags and location in anodized aluminum frame or plastic laminated.
1. Equipment Nameplate Schedule: For each item of equipment to be labeled, on 8½ by 11-inch bond paper. Tabulate equipment identification number(s) and identify where equipment is located, plus the Specification Section number and title where equipment is specified.
    - a. Equipment schedule shall be included in operation and maintenance data.
  2. Valve Tag Schedules: For each piping system, on 8½ by 11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
    - a. Valve-tag schedule shall be included in operation and maintenance data.

## 2.6 STENCILS

- A. Stencils: With clean, die-cut symbols and letters of following size:
1. Up to 2-inches Outside Diameter of Insulation or Pipe: ½-inch high letters.
  2. 2½ to 6-inches Outside Diameter of Insulation or Pipe: 1-inch-high letters.
  3. Over 6-inches Outside Diameter of Insulation or Pipe: 1¾-inches high letters.
  4. Equipment: 1¾-inches high letters.
- B. Stencil Paint: As specified in Division 09, semi-gloss enamel, colors and lettering size, conforming to ASME A13.1.

## 2.7 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1:
1. Preprinted, color-coded, with lettering indicating service, and showing flow direction.
  2. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  3. Lettering Size: At least 1½-inches high.
- B. Plastic Pipe Markers:
1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Tape Pipe Markers:
1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Pipe Markers:

1. Metal pipe: Bright colored continuously printed plastic ribbon tape, minimum 6-inches wide by 4-mil thick, manufactured for direct burial service.
2. Plastic pipe: Bright colored, continuously printed, minimum 4-mil thick, solid aluminum foil core, manufactured for direct burial service and detectable with non-ferrous metal detector.
3. Size per burial depth:
  - a. 2-inch-wide tape for up to 14-inch-deep burial.
  - b. 3-inch-wide tape for 14- to 24-inch-deep burial.
  - c. 6-inch-wide tape for 24- to 36-inch-deep burial.

## **2.8 CEILING MARKERS**

- A. Description: Laminated three-layer plastic with 1/8-inch minimum engraved black letters on white background or color matching lay-in ceiling grid.
  1. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
  2. Match description used on Equipment Label or Valve Tag.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Verify all piping has been insulated, painted and/or installed prior to beginning of identification installation.
- B. Coordinate pipe service and direction of flow with installing contractor.
- C. Degrease and clean surfaces to receive adhesive for identification materials.
- D. Prepare surfaces in accordance with Division 09 for stencil painting.

### **3.2 INSTALLATION**

- A. Apply stencil painting in accordance with Division 09. All painting shall be done in a careful, neat, and workmanlike manner, with particular care being exercised to protect building equipment and finishes. All surfaces shall be thoroughly cleaned or rust, scale, dirt, grease, dust, and like items, and sanded so as to provide a bond for new paint. All painted surfaces under this Contract shall be finished in an acceptable manner.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Install underground plastic pipe marker tape below finished grade, directly above buried pipe. Install detectable utility marking tape above all non-metallic, outside pipelines.
- F. Identify water heaters, pumps, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags:
  1. In buildings where existing piping systems are modified, the new valve tag numbers and list shall be coordinated with existing valve tag numbers and lists; and, those supplied under other contracts, if applicable.
- I. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure (where applicable). Install in clear view and align with axis of piping:
  1. On straight runs of piping at intervals not exceeding 20-feet.

2. Within 2-feet of all elbows.
  3. Within 2-feet of all piping as it passes through partitions (markers provided on both sides of partitions).
- J. Provide ceiling markers to locate valves and equipment. Above T-bar type panel ceilings locate on ceiling grid closest to equipment. At access panels locate on frame or door of access.

**END OF SECTION 22 0553**



**SECTION 22 1101  
PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.
- B. 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.

**1.2 SECTION INCLUDES**

- A. Work in this Section includes the following:
  - 1. Domestic Water System
  - 2. General Service Compressed Air System
  - 3. Natural Gas System
  - 4. Sanitary Waste and Vent and Grease Waste and Vent Systems
  - 5. Storm Water Collection Systems
  - 6. Non-Potable Water Systems

**1.3 RELATED SECTIONS**

- A. All sections of the Project Manual apply to this section.
- B. Refer to the following specification sections for specifics relating to the plumbing utility systems.
  - 1. 22 05 53 Identification for Plumbing Piping and Equipment
  - 2. 22 11 02 General-Duty Valves for Plumbing Piping
  - 3. 22 11 03 Plumbing Insulation
  - 4. 22 11 04 Hangers and Supports for Plumbing Piping and Equipment
  - 5. 22 11 16 Expansion Fittings and Loops for Plumbing Piping
  - 6. 22 24 01 Domestic Water System and Specialties
  - 7. 22 24 03 General Service Compressed Air Systems
  - 8. 22 24 23 Natural Gas System and Specialties
  - 9. 22 25 01 Sanitary Waste and Vent System and Specialties
  - 10. 22 25 02 Storm Water Collection System and Specialties
  - 11. 22 25 03 Chemical Waste Systems and Specialties

**1.4 REFERENCES**

- A. Refer to Section 22 0501 for complete listing of references.

**1.5 SUBMITTALS**

- A. Submittals shall be in accordance with Section 22 0502 – Shop Drawings and Submittals.
- B. The Contractor shall submit manufacturer's catalog data for the following:
  - 1. Domestic Water System

2. General Service Compressed Air System
  3. Natural Gas System
  4. Sanitary Waste and Vent and Grease Waste and Vent Systems
  5. Storm Water Collection Systems
  6. Non-Potable Water Systems
- C. The Contractor shall submit Certificates of Compliance for the following:
1. Schedule of UL listed through penetration assemblies

## **PART 2 - PRODUCTS**

### **2.1 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tubing: ASTM B88, Type L hard drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
- B. Copper Tubing: ASTM B88, Type L hard drawn, rolled grooved ends.
1. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, or ASTM B584 bronze sand castings, grooved ends.
  2. Joints: Grooved mechanical couplings meeting ASTM F1476.
    - a. Housing Clamps: ASTM A395 and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
    - b. Gasket: Elastomer composition for operating temperature range from 40 degrees F to 200 degrees F.
    - c. Accessories: Steel bolts, nuts, and washers.

### **2.2 ACID WASTE AND VENT PIPING**

- A. Polypropylene piping: ASTM F1412, Sch 40
1. Pipe shall be supplied with factory grooves for no hub mechanical fitting.
  2. Basis of design is Orion Blueline.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. All materials, equipment and accessories specified in this section shall be installed in strict accordance with the manufacturers' recommendations.

### **3.2 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Permanent sleeves are not required for holes formed by removable PE sleeves.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2-inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2-inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6-inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6-inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire-stop materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.3 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846 Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Non-pressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138

Appendix.

7. Plastic Pressure Piping, Gasketed Joints: Join according to ASTM D 3139.
8. Plastic Non-pressure Piping, Gasketed Joints: Join according to ASTM D 3212.
9. Plastic-Piping Electrofusion Joints: Make polyolefin drainage-piping joints according to ASTM F 1290.

### **3.4 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2½ and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.5 EXCAVATION, COMPACTION, BACKFILL**

- A. Excavation, compaction and backfill shall be as specified in Division 31- Trenching.

### **3.6 PIPING INSTALLATION**

- A. General
1. All piping in finished areas shall be run concealed. The Contractor shall furr in piping or provide soffit as required and in accordance with the Professional's instructions. All piping shall be installed as required to suit space available in building structure, above suspended ceilings, and other locations found necessary for installation.
  2. The Contractor shall not install any piping that will interfere with any lights, openings, doors, windows, ductwork, equipment, and existing or special conditions. Headroom in front of openings, doors, or windows shall not be less than the top of the opening. Provide all piping offsets necessary to avoid interferences with other work. Piping offsets shall include all devices and assemblies necessary to accommodate the change in direction of the piping.
  3. All piping shall run straight with no more couplings and joints than necessary, shall be grouped wherever practical and shall be carefully installed to provide for proper alignment slope and expansion
  4. Pipes carrying fluids shall not be installed in transformer vaults, electrical equipment rooms, elevator hoistways, elevator equipment rooms, or similar areas having a collection of electrical equipment. Pipes shall not be installed over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals, boxes, or similar electrical equipment.
  5. All piping shall be installed with a minimum of 2-inches between finish covering of pipe and all other work or piping.
  6. All piping shall have shut-off valves at all branch connections to mains.
  7. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted.
  8. The Contractor shall perform excavation of the subgrade where required for the installation of the work, including that for piping and piping enclosures. The backfill shall be stabilized by hand or pneumatic tamping as directed by the Professional and shall be

returned to the original subgrade level. Piping shall not be run in cinder fill unless protected by a concrete envelope of 2-inches minimum thickness on all sides of pipe. All steel and copper piping and fittings installed underground shall be protected with two layers of tightly applied spirally wrapped tape. Basis of design shall be 3M number 50.

9. Bullhead connections in any piping service are prohibited.
10. All screwed joints shall be made with a non-corrosive, non-hardening compound or Teflon tape applied on the male thread only. All compounds must be approved for the pipe on which they are used. Pipe ends shall be reamed or filed out to size of bore and all chips and cuttings removed. Ends of pipe must be cut square so as to seat in the bottom of the recess in drainage fittings. In making joints in chromium plated brass pipe no more than one thread shall remain exposed when joint is completed. Caulking of screwed joints is not permitted. Pipe joint cement and paint will be permitted only on external threads.
11. All soldered joints shall be made with fittings specified. Copper tube and brass pipe, valves, unions, flanges, fittings, and connections shall be joined by means of lead free solder. Ends of all pipes and inside surfaces of fittings shall be cleaned, burnished and tinned before solder is applied. All joints in tubing 2-inches and larger shall be tinned and then soldered with a circular type flame torch.
12. Pull joints, saddle type joints, and "T-Drill" type connections are prohibited.

B. Drainage Piping

1. All building drainage piping shall be set true to line and even slope using grade boards and targets or grade lines in accordance with ASTM C12, "Recommended Practice for Laying Sewer Pipe".
2. Horizontal sanitary and storm piping shall be installed to pitch towards drain points.
3. To join screwed pipe to cast iron pipe, provide ring on screwed pipe to form spigot end.
4. All changes in pipe size of soil, waste, and drain lines shall be made with reducing fittings or reducers. Changes in direction, where space permits, shall be made with long sweep bends, Y-fittings, and one-eighth (1/8) or one-sixteenth (1/16) bends, or combination "Y" and 1/8 bends.
5. Cleanouts shall be furnished installed on horizontal runs and at the base of stacks for all soil, waste, drain, and rain conductor lines.
6. A cleanout shall be installed at every change of direction of 180-degrees (a long-sweep bend is equal to two (2) 45-degree bends). Cleanouts shall be installed not more than 100-feet apart. Cleanouts on horizontal runs above ground, including crawl spaces, shall be cast brass plugs in wye fittings. Cleanouts at the base of each vertical stack shall be cast brass plugs in wye or cleanout tee fittings. Cleanouts on buried or concealed lines shall be brought flush with grade or floor level. Cleanouts in walls shall be brought flush with finished face of the wall. Cleanouts on underground lines shall be made with wye and 45-degree fittings. Terminal cleanouts on underground lines shall have a concrete cradle bearing block set against undisturbed earth. 45-degree fittings shall be set against concrete cradle to prevent separation or misalignment of joints. Cleanout plugs shall be full size for pipe up to and including 4-inch diameter and not less than 4-inch diameter for larger size pipe.
7. Cleanouts shall not be located in air plenums. Cleanouts shall be extended to the floor above or wall in order to locate the cleanout outside of the air plenum.
8. Water closet floor flanges shall be cast iron, screwed or caulked, not less than 1/4-inch thick; not less than 2-inches caulking depth. Bolted with approved gasket between closet

bowl and flange. Closet screws shall be of brass. The use of commercial putty or plaster for setting closet bowls is prohibited.

C. Pressure Piping

1. Branch piping shall be as indicated, but shall be a minimum  $\frac{3}{4}$ -inch in nominal size with the last ten feet to each  $\frac{1}{2}$ -inch outlet fixture a minimum of  $\frac{1}{2}$ -inch in nominal size or where indicated.
2. Each water piping system within the building shall be properly arranged and graded to low points where the entire system can be emptied through a drain.
3. Drain Valves - Furnish and install a  $\frac{1}{2}$ -inch rough brass hose bibb with female hose connection, cap and chain at all low points of the domestic water piping systems. The hose bibb shall be located so as to be accessible and easily operable, and so that a hose can be connected to the outlet.
4. Outside water piping shall be so graded and arranged that water can be drained from the underground piping through drains installed in the building served. The drains shall be the same size and type specified for interior piping.
5. Exposed piping at fixture rough-in [and at food preparation fixtures] shall be chrome plated brass [(from insulation to fixture or equipment connection)].

D. Equipment Piping

1. Provide shutoff valves in supply and return to each item of equipment such as pumps, tanks, automatic valves, and similar items. Valves shall be suitably located to isolate each unit to facilitate maintenance or removal of all equipment and apparatus. Valves shall be flanged or have a union installed between valve and equipment.
2. Provide all piping from backflow preventers, pump glands, relief valves, mud drains, or other drainage to spill over open sight drains, floor drains, or other trapped acceptable discharge points, and terminate with plain end (unthreaded) pipe.
3. Provide thermometer wells and pressure gauge wells for specified thermometers and gauges, and at the inlet and outlet connection of each piece of equipment specified in this contract.

E. Natural Gas Piping

1. Horizontal fuel gas piping shall slope up in direction of flow not less than  $\frac{1}{4}$ -inch in 15-feet.
2. Provide 6-inch drip leg and cap and shutoff valve at each piece of gas fired equipment, at the ends of horizontal runs and at the base or risers.
3. All fuel gas piping shall be installed in accessible locations. Piping located in or below concrete slabs shall be run in channels in the floor with suitable access panels. Where approved by the local gas utility, gas piping may be embedded in the floor slab. Such piping shall be surrounded by not less than 1-1/2 inches of Portland cement and piping shall not be permitted to be in physical contact with any other metallic materials.
4. Gas tubing run inside hollow walls or partitions shall be protected with a steel striker barrier at least 0.0508-inches thick. Striker barriers shall extend 4-inches beyond concealed penetrations or plates, fire stops, etc. Rigidly securing tubing run vertically inside hollow walls or partitions shall be prohibited.
5. Where gas piping is installed inside of vertical chases, welded joints shall be used. The chase shall be vented at the top and the vent run to the outside, in accordance with NFPA 54 requirements. The minimum vent pipe size shall be 1-1/4 inch. Vent piping may be steel, cast iron or copper. The Contractor shall determine the routing of this pipe and coordinate with all other trades.

6. Polyethylene fuel gas piping shall be installed in accordance with standards and specifications of the gas company and the piping manufacturer. Fusion of mechanical joints must be installed by workmen qualified in accordance with D.O.T./MTB/49CFR Part 192.
  7. Use of polyethylene fuel gas piping is prohibited above ground and under floor slabs. Transition from polyethylene to steel pipe shall be made underground and piping brought Aboveground before entering the building.
- F. Piping installation testing shall be in accordance with North Carolina State Building Code – Fuel Gas Code, Section 406, 2009 Edition.

### **3.7 ELECTROLYSIS CONTROL**

- A. All copper pipe and tubing installed under this Contract shall be installed so that the pipe and tubing will not touch or come in contact with ferrous metals. Where copper tubing or piping for fittings is anchored, guided, supported, secured, or may come in contact with ferrous metal, an insulating nonconductor spacer, similar to rubber or fiber, shall be installed to assure prevention of electrolysis.
- B. When copper tubing or piping is connected to ferrous piping or equipment, connections shall be made with dielectric unions, couplings, or isolating flanges.

### **3.8 PROTECTION AGAINST PHYSICAL DAMAGE**

- A. In concealed locations, where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1¼-inches from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 1/16-inch thick steel, shall cover the area of the pipe where the member is notched or bored and shall extend a minimum of 2-inches above sole plates and below top plates.
- B. Fuel gas piping shall be protected in accordance with NFPA 54.

### **3.9 CATHODIC PROTECTION OF UNDERGROUND FUEL GAS PIPE**

- A. All non-plastic underground fuel gas piping shall be cathodically protected. Provide a minimum of seventeen pound magnesium anodes containing six percent (6%) aluminum and three percent (3%) zinc alloy. Anodes shall be distributed equally along the pipe run, but spacing shall not exceed 100-feet between anodes. Each anode shall be attached to the pipe by the Caldwell and brazing process. The connecting wire shall be #12 A.W.G. copper with TW insulation. Each anode shall be repacked and shall be buried in backfill composed of seventy-five percent (75%) gypsum, twenty percent (20%) bentonite and five percent (5%) sodium sulphate. Wherever the underground gas piping rises above grade, provide an insulating dielectric fitting.

**END OF SECTION 22 1101**



**SECTION 22 1102  
GENERAL DUTY VALVES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.
- B. 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.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Gate valves.
  - 2. Ball valves.
  - 3. Butterfly valves.
  - 4. Check valves.
  - 5. Globe valves
  - 6. Chainwheels
- B. Related Sections:
  - 1. Section 22 1101 - Plumbing Piping
  - 2. Section 22 1103 - Plumbing Insulation
  - 3. Section 22 1104 - Hangers and Supports for Plumbing Piping and Equipment
  - 4. Section 22 2401 - Domestic Water System and Specialties
  - 5. Section 22 2403 - General Service Compressed Air Systems
  - 6. Section 22 2423 - Natural Gas System and Specialties
  - 7. Section 22 2501 - Sanitary Waste and Vent System and Specialties
  - 8. Section 22 2502 - Storm Drainage System and Specialties

**1.3 REFERENCES**

- A. Refer to Section 22 0501 for complete listing of references.

**1.4 SUBMITTALS**

- A. Section 22 0502 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Requirements for submittals.
- B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.
- C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.5 CLOSEOUT SUBMITTALS**

- A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.

- B. Project Record Documents: Record actual locations of valves.
- C. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

**1.6 QUALITY ASSURANCE**

- A. Perform Work in accordance with all NCBC Plumbing Code requirements.
- B. Maintain one copy of the NCBC Plumbing Code document on site.

**1.7 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three (3) years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three (3) years documented experience [approved by manufacturer].

**1.8 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one (1) week prior to commencing work of this section.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.

**1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install valves underground when bedding is wet or frozen.

**1.11 WARRANTY**

- A. Division 01 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five year manufacturer warranty for valves excluding packing.

**1.12 EXTRA MATERIALS**

- A. Division 01 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish two (2) packing kits for each size valve.

**PART 2 - PRODUCTS**

**2.1 GATE VALVES**

- A. Manufacturers:
  - 1. Conbraco Industries, Inc.; Apollo Valve
  - 2. Crane Valve, North America
  - 3. Hammond Valve
  - 4. Milwaukee Valve Company
  - 5. NIBCO, Inc.
  - 6. Stockham Valves & Fittings
- B. 2-inches and Smaller: MSS SP 80, Class 150, bronze body, bronze trim, union bonnet, rising stem, hand-wheel, inside screw, solid wedge disc, alloy seat rings, solder or threaded ends.
- C. 2½-inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet,

rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6-inches and larger mounted over 8-feet above floor.

## 2.2 BALL VALVES

- A. Manufacturers:
1. Conbraco Industries, Inc.; Apollo Valve
  2. Crane Valve, North America
  3. Hammond Valve
  4. Milwaukee Valve Company
  5. NIBCO, Inc.
  6. Stockham Valves & Fittings
- B. 2-inches and Smaller: MSS SP 110, 400 psi WOG, two-piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union, lever handle.

## 2.3 BUTTERFLY VALVES

- A. Manufacturers:
1. Conbraco Industries, Inc.; Apollo Valves
  2. Crane Valve, North America
  3. Hammond Valve
  4. Milwaukee Valve Company
  5. NIBCO, Inc.
  6. Stockham Valves & Fittings
- B. 2½-inches and Larger: MSS SP 67, Class 150.
1. Body: Cast or ductile iron, wafer, lug or grooved ends, stainless steel stem, extended neck.
  2. Disc: Stainless steel.
  3. Seat: Resilient replaceable EPDM, Buna N or neoprene Viton.
  4. Handle and Operator: Infinite position lever handle with memory stop. Furnish gear operators for valves 8-inches and larger, and chain-wheel operators for valves mounted over 8-feet above floor.

## 2.4 CHECK VALVES

- A. Horizontal Swing Check Valves:
1. Manufacturers:
    - a. Crane Valve, North America
    - b. Hammond Valve
    - c. Milwaukee Valve Company
    - d. NIBCO, Inc.
    - e. Stockham Valves & Fittings
  2. 2-inches and Smaller: MSS SP 80, Class 125 (200 CWP), bronze body and cap, bronze seat, Buna-N disc, threaded ends.

3. 2½-inches and Larger: MSS SP 71, Class 125 (200 CWP), cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. Manufacturers:
  - a. Crane Valve, North America
  - b. Hammond Valve Model
  - c. Milwaukee Valve Company
  - d. NIBCO, Inc.
  - e. Stockham Valves & Fittings
2. 2-inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.
3. 2½-inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center-guided bronze disc, stainless steel spring and screws, flanged ends.

**2.5 BRONZE GLOBE VALVES**

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Crane Co.; Crane Valve Group; Stockham Division.
  - c. Hammond Valve.
  - d. Kitz Corporation.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Powell Valves.
  - h. Red-White Valve Corporation.
  - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - j. Zy-Tech Global Industries, Inc.
2. Description:
  - a. Standard: MSS SP-80, Type 1.
  - b. CWP Rating: 200 psig.
  - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
  - d. Ends: Threaded.
  - e. Stem and Disc: Bronze.
  - f. Packing: Asbestos free.
  - g. Handwheel: Malleable iron, bronze, or aluminum.

**2.6 CHAINWHEELS**

A. Manufacturers:

1. Babbitt Steam Specialty Co.
2. Roto-Hammer Industries.

3. Trumbull Industries
- B. Description: Valve actuation assembly with sprocket rim, brackets and chain.
  1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
  2. Retain first subparagraph below for ball, butterfly, and plug valves.
  3. Attachment: For connection to ball and butterfly valve stems.
  4. Sprocket Rim with Chain Guides: Ductile or cast iron aluminum or bronze, of type and size required for valve.
  5. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify piping system is ready for valve installation.
  1. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
  2. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
  3. Examine threads on valve and mating pipe for form and cleanliness.
  4. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
  5. Do not attempt to repair defective valves; replace with new valves.

#### **3.2 INSTALLATION**

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install valves in position to allow full stem movement.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install ¾-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- E. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- F. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.
- G. Install chain wheels on operators for valves NPS 4 and larger and more than 96-inches above floor. Extend chains to 60-inches above finished floor.
- H. Install check valves for proper direction of flow and as follows:
  1. Swing Check Valves: In horizontal position with hinge pin level.
  2. Lift Check Valves: With stem upright and plumb.
- I. Refer to Section 22 1104 for pipe hangers.
- J. Refer to Section 22 1103 for insulation requirements for valves.
- K. Refer to Section 22 1101 for piping materials applying to various system types.
- L. For installation of valves in domestic water systems refer to Section 22 2401.

- M. For installation of valves in general service compressed air systems refer to Section 22 2403.
- N. For installation of valves in natural gas systems refer to Section 22 2423.
- O. For installation of valves in sanitary systems refer to Section 22 2501.
- P. For installation of valves in storm systems refer to Section 22 2502.

### **3.3 VALVE APPLICATIONS**

- A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section or as required.
- B. Install gate valves only as required on water utility entrance per local utility requirements.
- C. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.
- E. Install spring loaded check valves on discharge of water pumps.
- F. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- G. Install ball or butterfly valves in domestic water systems for shut-off service.
- H. Install globe valves in domestic water systems for throttling service.

### **3.4 ADJUSTING**

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing.
- B. Replace valves if persistent leaking occurs.

**END OF SECTION 22 1102**

**SECTION 22 1103  
PLUMBING INSULATION**

**PART 1 GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.

**1.2 SUMMARY**

- A. Section Includes:
1. Piping system insulation.
  2. Pipe insulation jackets.
  3. Insulation accessories including vapor retarders and accessories.
- B. Related Sections:
1. Division 09 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.
  2. Section 22 0553 - Identification for Plumbing Piping and Equipment: Product requirements for plumbing piping and equipment identification.
  3. Section 22 1104 - Hangers and Supports for Plumbing Piping and Equipment: Product and Execution requirements for inserts at hanger locations.

**1.3 REFERENCES**

- A. Refer to Section 22 0501 for complete listing of references.

**1.4 SUBMITTALS**

- A. Division 01 - Submittal Procedures and 22 05 02 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  2. Detail insulation application at pipe expansion joints for each type of insulation.
  3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  4. Detail removable insulation at piping specialties, equipment connections, and access panels.
  5. Detail application of field-applied jackets.
  6. Detail application at linkages of control devices.
  7. Detail field application for each equipment type.
- C. Qualification Data: For qualified Installer.

**1.5 QUALITY ASSURANCE**

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
1. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
    - a) Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed

index of 50 or less.

- b) Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

- B. Perform Work in accordance with State, Federal and local standards.
- C. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- D. Maintain one (1) copy of each document on site.

#### **1.6 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three (3) years documented experience.

#### **1.7 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one (1) week prior to commencing work of this section.

#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

#### **1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Division 01 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature during and after installation for minimum period of 24 hours.

#### **1.10 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.11 WARRANTY**

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

### **PART 2 PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Certain Teed Corporation
- B. Johns Manville Co.
- C. Knauf Fiberglass GmbH
- D. USG Interiors, Inc. – Thermafiber Division
- E. Owens-Corning Fiberglass Corporation
- F. or other equivalent product.



## 2.2 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Cell-U-Foam Corporation; Ultra-CUF.
    - b) Pittsburgh Corning Corporation; Foamglas Super K.
    - c) or other equivalent product.
  - 2. Block Insulation: ASTM C 552, Type I.
  - 3. Special-Shaped Insulation: ASTM C 552, Type III.
  - 4. Board Insulation: ASTM C 552, Type IV.
  - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  - 6. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
  - 7. Factory fabricated shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Aeroflex USA Inc.; Aerocel.
    - b) Armacell LLC; AP Armaflex.
    - c) RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
    - d) or other equivalent product.
- H. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Fibrex Insulations Inc.; Coreplus 1200.
    - b) Johns Manville; Micro-Lok.
    - c) Knauf Insulation; 1000 Pipe Insulation.
    - d) Manson Insulation Inc.; Alley-K.
    - e) Owens Corning; Fiberglas Pipe Insulation.
    - f) or other equivalent product. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

- I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Armacell LLC; Tubolit.
    - b) Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
    - c) RBX Corporation; Therma-cell.
    - d) or other equivalent product.

### 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
  - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Childers Products, Division of ITW; CP-97.
    - b) Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
    - c) Marathon Industries, Inc.; 290.
    - d) Mon-Eco Industries, Inc.; 22-30.
    - e) Vimasco Corporation; 760.
    - f) or other equivalent product.
- B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
  - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Childers Products, Division of ITW; CP-96.
    - b) Foster Products Corporation, H. B. Fuller Company; 81-33.
    - c) or other equivalent product.
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Aeroflex USA Inc.; Aero seal.
    - b) Armacell LCC; 520 Adhesive.
    - c) Foster Products Corporation, H. B. Fuller Company; 85-75.
    - d) RBX Corporation; Rubatex Contact Adhesive.
    - e) or other equivalent product.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Childers Products, Division of ITW; CP-82.
    - b) Foster Products Corporation, H. B. Fuller Company; 85-20.

- c) ITW TACC, Division of Illinois Tool Works; S-90/80.
  - d) Marathon Industries, Inc.; 225.
  - e) Mon-Eco Industries, Inc.; 22-25.
  - f) or other equivalent product.
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Childers Products, Division of ITW; CP-82.
    - b) Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c) ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d) Marathon Industries, Inc.; 225.
    - e) Mon-Eco Industries, Inc.; 22-25.
    - f) or other equivalent product.
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Dow Chemical Company (The); 739, Dow Silicone.
    - b) Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    - c) P.I.C. Plastics, Inc.; Welding Adhesive.
    - d) Red Devil, Inc.; Celulon Ultra Clear.
    - e) Speedline Corporation; Speedline Vinyl Adhesive.
    - f) or other equivalent product.

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Childers Products, Division of ITW; CP-35.
    - b) Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c) ITW TACC, Division of Illinois Tool Works; CB-50.
    - d) Marathon Industries, Inc.; 590.
    - e) Mon-Eco Industries, Inc.; 55-40.
    - f) Vimasco Corporation; 749.
    - g) or other equivalent product.
  - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Childers Products, Division of ITW; CP-10.
    - b) Foster Products Corporation, H. B. Fuller Company; 35-00.
    - c) ITW TACC, Division of Illinois Tool Works; CB-05/15.
    - d) Marathon Industries, Inc.; 550.
    - e) Mon-Eco Industries, Inc.; 55-50.
    - f) Vimasco Corporation; WC-1/WC-5.
    - g) or other equivalent product.
  2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 200 deg F.
  4. Solids Content: 63 percent by volume and 73 percent by weight.
  5. Color: White.

## **2.5 LAGGING ADHESIVES**

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Childers Products, Division of ITW; CP-52.
    - b) Foster Products Corporation, H. B. Fuller Company; 81-42.
    - c) Marathon Industries, Inc.; 130.
    - d) Mon-Eco Industries, Inc.; 11-30.
    - e) Vimasco Corporation; 136.
    - f) or other equivalent product.
  2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
  3. Service Temperature Range: Minus 50 to plus 180 deg F.
  4. Color: White.

## **2.6 SEALANTS**

- A. Joint Sealants:
  1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:
    - a) Childers Products, Division of ITW; CP-76.
    - b) Foster Products Corporation, H. B. Fuller Company; 30-45.
    - c) Marathon Industries, Inc.; 405.
    - d) Mon-Eco Industries, Inc.; 44-05.
    - e) Pittsburgh Corning Corporation; Pittseal 444.
    - f) Vimasco Corporation; 750.

- g) or other equivalent product.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Permanently flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 100 to plus 300 deg F.
  - 5. Color: White or gray.
- B. FSK and Metal Jacket Flashing Sealants:
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Childers Products, Division of ITW; CP-76-8.
    - b) Foster Products Corporation, H. B. Fuller Company; 95-44.
    - c) Marathon Industries, Inc.; 405.
    - d) Mon-Eco Industries, Inc.; 44-05.
    - e) Vimasco Corporation; 750.
    - f) or other equivalent product.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: Aluminum.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 2. Fire- and water-resistant, flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 4. Color: White.

## 2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
- 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
  - 4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
  - 5. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
- a) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

## 2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Childers Products, Division of ITW; Metal Jacketing Systems.
    - b) PABCO Metals Corporation; Surefit.
    - c) RPR Products, Inc.; Insul-Mate.
    - d) or other equivalent product.
  - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
    - a) Sheet and roll stock ready for shop or field sizing Factory cut and rolled to size.
    - b) Finish and thickness are indicated in field-applied jacket schedules.
    - c) Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
    - d) Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
    - e) Factory-Fabricated Fitting Covers:
      - 1) Same material, finish, and thickness as jacket.
      - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      - 3) Tee covers.
      - 4) Flange and union covers.
      - 5) End caps.
      - 6) Beveled collars.
      - 7) Valve covers.
      - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- C. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b) Compac Corp.; 104 and 105.
    - c) Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d) Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
    - e) or other equivalent product.
  - 2. Width: 3-inches.
  - 3. Thickness: 11.5-mils.

4. Adhesion: 90-ounces force/inch in width.
  5. Elongation: 2-percent.
  6. Tensile Strength: 40-lbf/inch in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a) Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    - b) Compac Corp.; 130.
    - c) Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    - d) Venture Tape; 1506 CW NS.
    - e) or other equivalent product.
  2. Width: 2-inches.
  3. Thickness: 6-mils.
  4. Adhesion: 64-ounces force/inch in width.
  5. Elongation: 500-percent.
  6. Tensile Strength: 18-lbf/inch in width.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    - b) Compac Corp.; 120.
    - c) Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    - d) Venture Tape; 3520 CW.
    - e) or other equivalent product.
  2. Width: 2-inches.
  3. Thickness: 3.7-mils.
  4. Adhesion: 100-ounces force/inch in width.
  5. Elongation: 5-percent.
  6. Tensile Strength: 34-lbf/inch in width.
- D. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3-inches.
  2. Film Thickness: 6-mils.
  3. Adhesive Thickness: 1.5-mils.
  4. Elongation at Break: 145-percent.
  5. Tensile Strength: 55-lbf/inch in width.

## 2.10 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, available products that may be

incorporated into the Work include, but are not limited to, the following:

- a) Childers Products; Bands.
  - b) PABCO Metals Corporation; Bands.
  - c) RPR Products, Inc.; Bands.
  - d) or other equivalent product.
2. Stainless Steel: ASTM A 167 or ASTM A 240, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
  3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
  4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
  5. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
    - a) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      - 2) GEMCO; Perforated Base.
      - 3) Midwest Fasteners, Inc.; Spindle.
      - 4) or other equivalent product.
    - b) Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
    - c) Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
    - d) Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
  6. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
    - a) Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
    - b) Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
    - c) Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
  7. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
    - a) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.



- 2) GEMCO; Press and Peel.
      - 3) Midwest Fasteners, Inc.; Self Stick.
      - 4) or other equivalent product.
    - b) Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
    - c) Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
    - d) Adhesive-backed base with a peel-off protective cover.
  8. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
    - a) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) AGM Industries, Inc.; RC-150.
      - 2) GEMCO; R-150.
      - 3) Midwest Fasteners, Inc.; WA-150.
      - 4) Nelson Stud Welding; Speed Clips.
      - 5) or other equivalent product.
    - b) Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
  9. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) C & F Wire.
    - b) Childers Products.
    - c) PABCO Metals Corporation.
    - d) RPR Products, Inc.
    - e) or other equivalent product.

## **2.11 CORNER ANGLES**

- A. PVC Corner Angles: 30 mils thick, minimum 1 x 1-inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 x 1-inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.
- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 x 1-inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Division 01 - Administrative Requirements: Coordination and project conditions.

- B. Verify piping and equipment has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 INSTALLATION

- A. Exposed Piping: Locate insulation and cover seams in least visible locations.
- B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- C. Man made mineral fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- E. Man made mineral fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. Inserts and Shields:
  - 1. Application: Piping 1½-inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under finish jacket.
  - 4. Insert configuration: Minimum 6-inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
  - 5. Insert material: Compression resistant insulating material suitable for planned temperature range and service.
- G. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Division 07 for penetrations of assemblies with fire resistance rating greater than one hour.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 8- feet above finished floor): Finish with aluminum jacket or stainless steel jacket.
- I. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position

on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal equipment.

- J. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1-mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- K. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.
- L. Factory Insulated Equipment: Do not insulate.
- M. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- N. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- O. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- P. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- Q. Mineral fiber insulated equipment containing fluids below ambient temperature: Provide vapor retarder jackets, factory-applied or field-applied. Finish with glass-cloth and vapor barrier adhesive.
- R. Mineral fiber insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor retarder, factory-applied or field-applied. Finish with glass cloth and adhesive.
- S. Finish insulation at supports, protrusions, and interruptions.
- T. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.
- U. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- V. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

### **3.4 FINISHES**

- A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a) Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

**3.6 SCHEDULES**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  1. Underground copper piping.
  2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
- C. Plumbing Systems:
  1. Domestic Hot (Tempered) Water Supply:
    - a) 1-1/4 NPS and smaller:
      - 1) Man Made Mineral Fiber Insulation: 1-inch
      - 2) Cellular Glass Insulation: 1½-inch
      - 3) Cellular Polyisocyanurate Insulation: 1-inch
      - 4) Cellular Phenolic Foam Insulation: 1-inch
      - 5) Elastomeric Cellular Foam Insulation: ¾-inch
    - b) 1-1/2 NPS and larger:
      - 1) Man Made Mineral Fiber Insulation: 1-inch
      - 2) Cellular Glass Insulation: 1½-inch
      - 3) Cellular Polyisocyanurate Insulation: 1-inch
      - 4) Cellular Phenolic Foam Insulation: 1-inch
      - 5) Elastomeric Cellular Foam Insulation: 1-inch
  2. Domestic Cold Water:
    - a) 1 NPS and smaller:
      - 1) Man Made Mineral Fiber Insulation: 1-inch
      - 2) Cellular Glass Insulation: 1½-inch
      - 3) Cellular Polyisocyanurate Insulation: 1-inch
      - 4) Cellular Phenolic Foam Insulation: 1-inch
      - 5) Elastomeric Cellular Foam Insulation: ¾-inch
    - b) 1-1/4 NPS and larger:
      - 1) Man Made Mineral Fiber Insulation: 1-inch
      - 2) Cellular Glass Insulation: 1½-inch
      - 3) Cellular Polyisocyanurate Insulation: 1-inch

- 4) Cellular Phenolic Foam Insulation: 1-inch
- 5) Elastomeric Cellular Foam Insulation: 1-inch
3. Sanitary Drainage from floor drains receiving condensate from HVAC systems:  $\frac{3}{4}$ -inch Elastomeric Cellular Foam from floor drain body and all horizontal pipe runs.
4. Sanitary Drainage from electric water coolers:  $\frac{3}{4}$ -inch Elastomeric Cellular Foam.
- D. Plumbing Systems:
  1. Domestic Hot Water Storage Tanks (not Factory Insulated):
    - a) Mineral Fiber Blanket Insulation: 2-inches thick.
    - b) Mineral Fiber Board Insulation: 1½- inches thick.
    - c) Hydrous Calcium Silicate Insulation: 1½-inches thick.
    - d) Cellular Phenolic Foam Insulation: 1½-inches thick.
    - e) Glass Fiber, Rigid Insulation: 2-inches thick.

**END OF SECTION 22 1103**

**SECTION 22 1104**  
**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 00 and 01 are a part of these Specifications.
- B. 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.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Pipe hangers and supports.
  - 2. Hanger rods.
  - 3. Inserts.
  - 4. Flashing.
  - 5. Sleeves.
  - 6. Escutcheons
  - 7. Mechanical sleeve seals.
  - 8. Formed steel channel.
  - 9. Grout
  - 10. Firestopping relating to plumbing work.
  - 11. Firestopping accessories.
  - 12. Equipment bases and supports.
- B. Related Sections:
  - 1. Division 03 - Concrete Forming and Accessories
  - 2. Division 03 - Cast-In-Place Concrete
  - 3. Division 07 – Fire-stopping
  - 4. Division 07 - Joint Protection
  - 5. Division 07 - Installation requirements for roof flashing installation.
  - 6. Division 09 - Painting and Coating
  - 7. Section 22 0501 - Common Work Results for Plumbing
  - 8. Section 22 2401 - Domestic Water System and Specialties
  - 9. Section 22 2433 - Natural Gas System and Specialties
  - 10. Section 22 2501 - Sanitary Waste and Vent System and Specialties
  - 11. Section 22 2502 - Storm Water Collection System and Specialties

**1.3 REFERENCES**

- A. Refer to Section 22 0501 for complete listing of references.

**1.4 DEFINITIONS**

- A. Fire-stopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

#### **1.5 SYSTEM DESCRIPTION**

- A. Fire-stopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction in accordance with FM or UL requirements.
- B. Surface Burning: ASTM E84 UL 723 with maximum flame spread / smoke developed rating of 25/50.
- C. Fire-stop interruptions to fire rated assemblies, materials, and components.

#### **1.6 PERFORMANCE REQUIREMENTS**

- A. Fire-stopping: Conform to applicable code (FM or UL) for fire resistance ratings and surface burning characteristics.
- B. Fire-stopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

#### **1.7 SUBMITTALS**

- A. Section 22 0502 – Plumbing Shop Drawings and Submittals, Substitutions and O&M Manuals: Submittal procedures.
- B. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
  - 2. Fire-stopping: Submit data on product characteristics, performance and limitation criteria.
- C. Fire-stopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Manufacturer's Installation Instructions:
  - 1. Hangers and Supports: Submit special procedures and assembly of components.
  - 2. Firestopping: Submit preparation and installation instructions.
- E. Welding certificates.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

#### **1.8 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
  - 4. ASME Boiler and Pressure Vessel Code: Section IX.
- B. Through Penetration Fire-stopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating

items connecting maximum of two stories.

- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- E. Surface Burning Characteristics: 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.
- F. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- G. Maintain one (1) copy of each document on site.

#### **1.9 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three (3) years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three (3) years documented experience.

#### **1.10 PRE-INSTALLATION MEETINGS**

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one (1) week prior to commencing work of this section.

#### **1.11 DELIVERY, STORAGE, AND HANDLING**

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

#### **1.12 ENVIRONMENTAL REQUIREMENTS**

- A. Division 01 - Product Requirements: Environmental conditions affecting products
- B. Do not apply fire-stopping materials when temperature of substrate material and ambient air is below 60-degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3-days after installation of fire-stopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

#### **1.13 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.14 WARRANTY**

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

### **PART 2 - PRODUCTS**

#### **2.1 PIPE HANGERS AND SUPPORTS**

- A. Provide all miscellaneous steel required for support of pipes and equipment other than steel shown on Structural Engineer's drawings.
- B. Pipe hanger design, materials, and manufacturer shall conform to the requirements defined in MSS SP58-88.



- C. The selection and spacing of pipe hangers shall comply with the data included in MSS SP69-91.
- D. All hanger materials including clevis hangers, rods, inserts, clamps, stanchions, brackets, shall have a factory applied finish of electro-plated zinc, unless noted otherwise.
- E. Hangers, clamps and supports for use on un-insulated copper piping shall be provided with inserts to isolate the copper piping from the hanger. Inserts shall be made of felt or plastic and shall be as manufactured by the hanger manufacturer.
- F. Insulated piping shall be provided with insulation shields. Hanger shall be sized to include piping diameter and insulation thickness.
- G. Manufacturers:
  - 1. B-Line Systems, Inc.
  - 2. Carpenter & Paterson Inc.
  - 3. ERICO/Michigan Hanger Co.
  - 4. Globe Pipe Hanger Products Inc.
  - 5. Grinnell Corp.
  - 6. MIRO Industries, Inc.
  - 7. PHD Manufacturing, Inc.
  - 8. Tolco Inc.
  - 9. Unistrut Corp.; Tyco International, Ltd.
- H. Hanger Materials:
  - 1. Horizontal Sanitary, Waste and Vent Piping and Storm water Piping:
    - a. 3-inch and smaller:
      - 1) B-Line                    B3100
      - 2) Anvil                    260
      - 3) PHD                    450
    - b. 4-inch and larger:
      - 1) B-Line                    B3102
      - 2) Anvil                    590
      - 3) PHD                    420
  - 2. Horizontal Domestic Water Piping:
    - a. 2-inch and smaller:
      - 1) B-Line                    B3100
      - 2) Anvil                    260
      - 3) PHD                    450
    - b. 2½-inch and larger:
      - 1) B-Line                    B3100
      - 2) Anvil                    260
      - 3) PHD                    450
    - c. AWWA piping:
      - 1) B-Line                    B3102
      - 2) Anvil                    590

- 3) PHD 420
- 3. Insulation Shields
  - a. All Piping:
    - 1) B-Line B3155
    - 2) Anvil 168
    - 3) PHD 160
- 4. Vertical Piping (Riser Clamps):
  - a. Copper Pipe (copper plated with plastic coated formed portion.):
    - 1) B-Line B3373CT
    - 2) Anvil CT-121C
    - 3) PHD 554
  - b. Steel Pipe:
    - 1) B-Line B3373
    - 2) Anvil 261
    - 3) PHD 550
- 5. Connectors:
  - a. Beam Clamps:
    - 1) B-Line B3033, B3050, B3291-B3297
    - 2) Anvil 88, 133, 134 or 292S
    - 3) PHD 360, 620
  - b. Concrete inserts:
    - 1) B-Line B2500, B3014
    - 2) Anvil 282, 285
    - 3) PHD 950
  - c. Welded beam attachments:
    - 1) B-Line B3083
    - 2) Anvil 66
    - 3) PHD 900
  - d. Piping adjacent to walls or steel columns, brackets:
    - 1) B-Line
    - 2) Anvil No. 194, 195, or 199 depending on weight to be supported.
    - 3) PHD
  - e. Base supports:
    - 1) B-Line
    - 2) Anvil Figure No. 259, or 264.
    - 3) PHD
- 6. Hanger Rods:
  - a. Hanger rod:

- 1) B-line
- 2) Anvil Figure No. 140.
- 3) PHD
- b. Continuous threaded rod:
  - 1) B-line
  - 2) Anvil Figure No. 146.
  - 3) PHD
- c. Eye Rods:
  - 1) B-line
  - 2) Anvil Figure No. 248
  - 3) PHD
- 7. Trapeze Hangers:
  - a. Direct Mounting Hangers:
    - 1) B-line
    - 2) Anvil Figure No. 46
    - 3) PHD

## 2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

## 2.3 INSERTS

- A. Inserts: Malleable iron case of [galvanized] steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.4 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counter Flashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
  - 1. Waterproofing: 5 lb./sq. ft sheet lead.
  - 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.

- G. Molded PE: Reusable, PE, tapered, cup-shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## **2.6 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.7 FORMED STEEL CHANNEL**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. B-Line Systems
  - 3. Midland Ross Corporation, Electrical Products Division
  - 4. Unistrut Corp.
- B. Product Description: Galvanized 12-gage thick steel. With holes 1½-inches on center.

## **2.8 GROUT**

- A. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
- B. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive fire-stopping.

### **3.2 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Obtain permission from the Professional before using powder-actuated anchors.
- E. Do not drill or cut structural members.

### **3.3 INSTALLATION – INSERTS**

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4-inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

### **3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Install in accordance with ASME B31.1, ASME B31.5, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69, and/or MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum ½-inch space between finished covering and adjacent work.
- D. Place hangers within 12-inches of each horizontal elbow.
- E. Use hangers with 1½-inch minimum vertical adjustment.
- F. Support horizontal cast iron pipe adjacent to each hub, with 5-feet maximum spacing between hangers.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide isolation packing between hanger or support and bare copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 1103.

### **3.5 INSTALLATION – FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3-inches minimum above finished roof surface with lead or material compatible with roofing worked 1-inch minimum into hub, 8-inches minimum clear on sides with 24 x 24-inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10-inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### **3.6 INSTALLATION – SLEEVES**

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1½-inches above finished floor level. Caulk sleeves. Extend sleeves through floors 3-inches above finished floor level in Kitchen or wet-areas.

- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire-stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel escutcheons at finished surfaces.

**3.7 INSTALLATION – FIRE-STOPPING**

- A. All openings in fire and/or smoke rated construction shall be sealed in accordance with a UL tested and approved firestopping system.

**3.8 FIELD QUALITY CONTROL**

- A. Division 01 - Quality Requirements or - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed fire-stopping for compliance with specifications and submitted schedule.

**3.9 CLEANING**

- A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of fire-stopping materials.

**3.10 PROTECTION OF FINISHED WORK**

- A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**3.11 SCHEDULES**

Pipe Hanger Spacing

PIPE MATERIAL	MAXIMUM HANGER SPACING	HANGER ROD DIAMETER
	Feet	Inches
ABS (All sizes)	4	3/8
Aluminum (All sizes)	10	1/2
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
CPVC, 1 inch and smaller	3	1/2
CPVC, 1-1/4 inches and larger	4	1/2
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
Fiberglass	4	1/2
Glass	8	1/2
Polybutylene	2.67	3/8
Polypropylene	4	3/8
PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

**END OF SECTION 22 1104**

**SECTION 22 6000**  
**GAS AND VACUUM SYSTEMS FOR LABORATORIES**

**PART 1 - GENERAL**

**1.1 General**

- A. Furnish and test the following systems:
  - 1. Lab Air
  - 2. Lab Vacuum
- B. Work includes outlets, valve boxes, valves, alarm systems, pressure and vacuum switches and miscellaneous accessories for complete systems.
- C. Work also includes pressure testing, precertification testing and final testing, including purging and analyzing.
- D. Work described in this section does not include electrical wiring for alarms and electrical accessories associated with the system.
- E. All equipment must be supported directly by structural members with adequate load-bearing capacity and material integrity, using appropriate anchoring/connection hardware. Under no circumstances may equipment be supported by connections to finish materials. For example, equipment hung from toggle bolts through plaster-on-lath, gypsum board or ACT ceilings is not acceptable.

**1.2 Code Compliance / Quality Assurance**

- A. Install in compliance NFPA 99, Chapter 4 as required and enforced by Authority having Jurisdiction (AHJ).
- B. Comply with local, state and federal codes applicable in this jurisdiction.
- C. Employ only qualified journeymen for this work. Employ a competent qualified mechanic/piping foreman who has satisfactorily completed at least five other similar installations for this work.
- D. All medical gas brazers must be certified according to NFPA 99. A copy of the certification must be available upon request.

**1.3 Coordination**

- A. Coordinate with other trades to assure timely installations and to avoid conflicts and interference.
- B. Work closely with the metal stud partition installer and/or mason to assure that anchors, sleeves, and similar items are provided in sufficient time to avoid delays; chases and openings are properly sized and prepared.
- C. Coordinate layout of medical gas systems in all spaces and identify all piping accurately and in accordance with Section 9 of this guideline.

**PART 2 - PRODUCTS**

**2.1 Qualifications of Manufacturers**

- A. Pipeline System Components
  - 1. One manufacturer shall supply the medical gas piping system equipment to include outlets, valves, manifolds, gauges, valve boxes and alarm boxes.
  - 2. Component manufacturer shall have a pipeline system engineer or product specialist available to periodically check with the Contractor during installation of pipeline system equipment and provide a service organization to certify the system.
  - 3. Provide ongoing service support to the Owner after acceptance of system.

## **2.2 Copper Piping Materials**

- A. Piping: Seamless Type K (ASTM B819) copper tubing, in accordance with NFPA 99 Chapter 4. Piping shall be precleaned and plugged by supplier before shipment to jobsite. Piping shall be labeled according to NFPA 99.
- B. Fittings: Wrought copper, brass or bronze designed expressly for brazed connection. C. Brazing alloy: Melting point of at least 1000°F.
- C. Flux: Do not use for copper-to-copper joints. Use flux for joining copper to brass or bronze. In those cases where flux is used, exercise particular care in applying the flux to avoid leaving any excess inside the completed joints.
- D. Isolation of copper tubing from dissimilar metal shall be accomplished either through use of copper tear drop hangers or plastic isolators. Duct tape shall not be used. Vibra-clamps or tube clamps shall be used with Unistruts (with appropriate isolator).
- E. The vacuum piping shall be 3/4 inch ID to the outlet extension.
- F. On-site cleaning: Shall be limited to re-cleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or tri-sodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot, potable water.
  - 1. Any on-site cleaning shall be supervised by DUMC personnel.
  - 2. Clean brushes, rubber gloves, towels and bags shall be used. After rinsing and drying the surfaces, the fittings, valves, etc. shall be placed in a clean bag until installation (to avoid recontamination).
- G. Where three (or more) piping systems are run together, Unistruts shall be used to support the pipes. These piping systems shall be spaced appropriately so that valves shall not interfere with or obstruct each other.

## **2.3 Laboratory Vacuum Systems**

- A. Provide system traps in each lab.

## **2.4 Laboratory Valves**

- A. Laboratory valves shall be needle type with serrated hose end connection.
- B. Forged brass body with polished chrome plated finish. Stainless steel needle and seat.
- C. Basis of design is WaterSaver laboratory service fixtures.

## **PART 3 - EXECUTION**

### **3.1 Medical Piped Gas Identification**

- A. Medical piped gas labels shall contain flow arrows and be color coded according to NFPA. Medical piped gases shall be labeled at 10 foot intervals. Piping shall contain labels before and after all wall penetrations and all piping turns. Piping shall be labeled at least once in each room.

### **3.2 Medical Piped Gas Installation**

- A. Pre-clean and prepare copper pipe, tubing, valves and fittings for medical gas service in accordance with Chapter 4 of NFPA 99, except those supplied especially prepared for such service by the manufacturer and received sealed on the job. Copper tubing shall be pre-cleaned, degreased and delivered sealed to the jobsite.
- B. Joints in the piping, except those at equipment requiring screwed connections, shall be made with silver brazing alloy or similar high melting point (at least 1000°F) brazing metal.
- C. Silver brazing material: Stay-Silv-15, Silvaloy-15, Aircosil No. 15 or Phos-Si Iver-15.



1. Silver brazing alloy composition: 15% silver, 80% copper and 5% phosphorus. No cadmium.
  2. Minimum of 1000°F liquid melting point with ASTM rating of “BCuP5”.
  3. The use of flux is prohibited for the making of joints between copper-to-copper pipes and fittings. Appropriate flux similar to “Stay-Silv-Black Flux” or “Stay-Silv-White Flux” is required between dissimilar metals such as copper to brass or bronze material, when parts are heated over a prolonged period.
- D. During the brazing of pipe connections, the interior of the pipe shall be purged continuously with oil-free, dry nitrogen. The outside of the tube and fittings shall be cleaned by washing with hot water after assembly.
- E. Threaded joints in piping systems shall be made up with polytetrafluorethylene (such as Teflon) tape or other thread sealants suitable for oxygen service. Apply sealants to the male threads only.
- F. Support piping with pipe straps or hangers at appropriate intervals and do not support from other piping. Piping shall be supported from the building structure. Under no circumstances shall piping or other equipment be suspended from finish materials such as dropped ACT ceilings or plaster lath.
1. Isolate copper piping from dissimilar metals. Duct tape shall not be used as an isolation material.
- G. Threaded joints in distribution piping shall be limited to the connection of gauges, switches and similar devices.
- H. Use flux with a silver (BAG series) brazing filler material. Some flux may contain compounds objectionable for oxygen service and shall not be employed.
- I. Pipe shall be prepared, fit together and brazed within the same 24-hour period to avoid contamination of the pipe. During intervals within the work where work is incomplete, end caps (sized according to pipe) shall be installed over the ends of the pipe and taped to avoid contamination.
- J. Fittings, valves and other components shall remain sealed until installation onto the system. Bags shall remain closed and sealed when not in use.
- K. On-site cleaning: Shall be limited to re-cleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or tri-sodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot, potable water.
1. Any on-site cleaning shall be supervised by DUMC personnel.
  2. Clean brushes, rubber gloves, towels and bags shall be used. After rinsing and drying the surfaces, the fittings, valves, etc. shall be placed in a clean bag until installation (to avoid recontamination).
- L. After installation of the piping but before installation of the outlet valves, blow lines clear by means of oil-free, dry nitrogen.
- M. Piping exposed to physical damage shall be adequately protected.
- N. While being brazed, joints shall be purged with inert gas (nitrogen NF) per NFPA 99.
- O. Uninstalled piping shall be kept on a pipe rack. This piping shall also be kept separate from other copper piping to avoid incorrect usage.

### **3.3 Installer Performance Testing**

- A. Testing shall be performed with oil-free, dry nitrogen. The installing Contractor shall perform the following steps:
1. Blow Down
  2. NFPA 99, 1999 4-3.4.1.2(a)
  3. Initial Pressure Test
  4. NFPA 99, 1999 4-3.4.1.2(b)
  5. Cross-Connection Test
  6. NFPA 99, 1999 4-3.4.1.2(c)
  7. Piping Purge Test
  8. NFPA 99, 1999 4-3.4.1.2(d)
  9. Standing Pressure Test
  10. NFPA 99, 1999 4-3.4.1.2(e)
    - a. Due to time schedules during construction, sections of piping systems can be tested so that walls can be closed-in. When sections of piping have been tested, the entire system must again be tested before final precertification and certification of the system.
    - b. Test apparatus shall be leak tested and found leak free before the start of the 24-hour test.
- B. All items in this section shall be documented in a report by Contractor per NFPA 99.

### **3.4 System Verification and Certification**

- A. Testing shall be performed with oil-free, dry nitrogen. The installing Contractor shall perform the following steps: Cross connection testing and precertification of the medical gas system must be performed by a party technically competent and experienced in the field of medical gas pipeline testing. A party other than the installing Contractor shall perform the following testing:
1. Cross-connection Test
  2. NFPA 99, 1999 4-3.4.1.3(a)
  3. Valve Test
  4. NFPA 99, 1999 4-3.4.1.3(b)
  5. Outlet Flow Test
  6. NFPA 99, 1999 4-3.4.1.3(c)
  7. Alarm Testing
  8. NFPA 99, 1999 4-3.4.1.3(d)
  9. Piping Purge Test
  10. NFPA 99, 1999 4-3.4.1.3(e)
  11. Piping Purity Test
  12. NFPA 99, 1999 4-3.4.1.3(f)
- B. Medical gas system shall be tested in accordance with NFPA 99, latest edition and these specifications.
- C. Obtain and present to the Owner a complete bond report of pipeline precertification from the equipment manufacturer. This letter of precertification shall indicate:
1. That the system is free of crossed connections.

2. That all system components perform to the manufacturer's design specifications.
  3. That all system components, particularly the alarm system, have been installed in accordance with the manufacturer's recommendations.
- D. This report must be submitted to Engineering and Operations (E&O) a minimum of 48 hours before the desired date of the tie-in. E&O, Administration and Respiratory Therapy will coordinate the tie-in with the contractor.

**END OF SECTION 22 6000**

## SECTION 23 0100

### HVAC GENERAL

#### PART 1 - GENERAL REQUIREMENTS

##### 1.1 DEFINITIONS

- A. Piping: Pipe, fittings, flanges, valves, controls, hangers, supports, traps, drains, gauges, insulation, vents, and items customarily required in connection with the transfer of fluids.
- B. Ductwork: All air distribution, re-circulation, and exhaust ducts, whether of sheet metal or other material, and includes all connections, hanger, supports, damper controls, insulation, accessories, fire and smoke control devices, and appurtenances necessary for and incidental to a complete system.
- C. Provide: Furnish and install complete ready for use.
- D. Furnish: Purchase and deliver to the project site complete with every necessary appurtenance and for installation.
- E. Install: Unload at the delivery point and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
- F. Concealed: Embedded in masonry or other construction, installed behind wall furring, above ceilings, in crawl spaces, in shafts or otherwise not visible.
- G. Exposed: Not concealed.
- H. By other Trades: Shall mean by persons or parties who are not anticipated to be the Subcontractor for this trade working together with the Prime Contractor. In this context the words "by other trades" shall be interpreted to mean not included in the overall contract.
- I. Contractor: As used in this Division of the specification refers to the Mechanical Contractor unless specifically noted otherwise.

##### 1.2 INTERPRETATION OF CONTRACT DOCUMENTS

- A. This section of the specifications and related drawings describe general provisions applicable to every section of Division 23.
- B. Attention is directed to General Conditions, which is binding in its entirety, on this portion of the work and in particular to paragraphs concerning materials, workmanship, and substitutions.
- C. Mention in these specifications, indications, and reasonable implications on drawings, whereby articles, materials, operation or methods related to execution of the mechanical work are noted, specified, drawing or described, thereby requires execution of each such item of work and provision of all labor, materials, equipment and appurtenances required for execution thereof.
- D. Particular attention is directed to the drawings and other contract documents for information pertaining to required items or work which are related to and usually associated with the work of this Division of the specifications, but which are to be provided as part of the work of other Divisions of the specifications.
- E. No exclusions from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenance or accessories necessary to complete any required system or item of equipment are to be omitted.
- F. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the intent diagrammatically expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements

necessary for complete work are excluded. When abbreviations appear on the drawings or specification in lower case letter with or without periods, their meanings shall be the same as stated above.

- G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.
- H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.
- I. The use of words in the singular shall be considered as limited where other indications denote that more than one item is referred to.
- J. Submission of a proposal and ultimate acceptance of an agreement or contract for execution of this section of work will be construed as evidence that the Prime Contractor, Subcontractor and Vendor has carefully read and accepts all conditions set forth in each division. Insofar as such conditions may affect both the bidding for and execution of this section of work.
- K. Where compliance with drawings or specifications is in apparent conflict with the applicable building codes or applicable UL listings then contractor shall contact the engineer of record. Generally building codes and UL compliance will take precedence over the specifications and drawings.

### **1.3 QUALITY ASSURANCE AND WARRANTY**

- A. The Contractor shall guarantee all work, materials and equipment furnished against defects, leaks, performance, and non-operation for a period of one (1) year after the date of the Owner's final acceptance, or as indicated in the General Conditions. Warranties to extend past this date are defined in individual equipment specification sections. Defects shall be interpreted as defective materials or equipment or unsatisfactory installation and are not intended to apply to ordinary wear and tear. The Contractor shall pay for any repairs or replacements caused by these defects within the period covered by the guarantee, including all incidental work required to correct the deficiency.
- B. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacturers of said equipment a minimum of three (3) years and, if directed by the Designer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim.
- C. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. UL or other label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
- D. All equipment of one type (such as fans, pumps, valves, grilles, etc.) shall be the products of one manufacturer unless specifically stated otherwise.
- E. Where the specifications do not list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.
- F. All welders shall be certified by the National Certified Pipe Welding Bureau for the appropriate service and shall perform all welding in accordance with Welding Bureau's procedures and the ASA Code for pipe welding. Welding and welder qualifications shall be in accordance with ASME Section IX.

#### **1.4 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Contractors shall submit to the appropriate Regulatory Agencies all items necessary to obtain all required permits obtain such required permits and pay all required fees.
- B. All work shall conform to the following Standards and Codes (applicable edition):
  - 1. North Carolina State Building Code.
  - 2. National Fire Protection Association.
  - 3. Uniform Boiler and Pressure Vessel Act of N.C. (Boiler Code).
- C. Where applicable, all fixtures, equipment, and materials shall be as approved or listed by the following:
  - 1. Factory Mutual Laboratories (FM).
  - 2. Underwriters Laboratories, Inc. (UL).
  - 3. CSA.
  - 4. ETL.
  - 5. AGA.
  - 6. AWWA.
- D. All fuel fired equipment shall meet the requirements of the agencies listed and also meet the Owner's insurer requirements.

#### **1.5 STANDARDS AND PROCEDURES**

- A. ADC: Air Diffusion Council.
- B. AMCA: Air Moving and Conditioning Association, Inc.
- C. ANSI: American National Standards Institute.
- D. API: American Petroleum Institute.
- E. ARI: American Refrigeration Institute.
- F. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
- G. ASME: American Society of Mechanical Engineers.
- H. ASTM: American Society of Testing and Materials.
- I. IBR: Institute of Boiler and Radiator Manufacturers.
- J. MSS: Manufacturers Standardization Society.
- K. NEMA: National Electrical Manufacturer's Association.
- L. OSHA: Occupational Safety and Health Administration.
- M. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
  - 1. Where reference is made to ASA Standards it shall be understood that this reference is to the standards published by ANSI.
  - 2. Include all items of labor and materials required to comply with such standards and codes. Where quantity, sizes or other requirements indicated on the drawings or herein specified are in excess of the standard or code requirements, the specifications or drawings, respectively, shall govern.

#### **1.6 EQUIVALENT PRODUCTS**

- A. Notwithstanding any reference in the specifications to any article, device, product, materials, fixture, form or type of construction by name, make, or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting

competition and the Contractor, in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the Designer, expressed in writing, is equal to that specified.

- B. Requests for written approval to substitute materials or equipment considered by the contractor as equal to those specified shall be submitted for approval, to the Engineer, in accordance with SUBSTITUTIONS section.

### **1.7 VERIFICATION OF DIMENSIONS AND LOCATIONS**

- A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Designer of any discrepancy, and submit shop drawings of any changes he proposes to make, in quadruplicate for approval, before starting the work. Contractor shall install all equipment in a manner to avoid building interference.
- B. The location of duct, pipe, fixture, equipment, and appurtenances for existing facilities are shown on plans to indicate the extent of work required. Exact condition shall be field verified.

### **1.8 COORDINATION WITH OTHER TRADES**

- A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. If interferences occur and clearances cannot be maintained as recommended by manufacturer and as required for maintenance and inspection of equipment, Contractor shall bring them to the attention of Designer, in writing, prior to signing of contract; or Contractor shall, at his own expense, provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interferences.
- B. Prepare composite coordination drawings at a scale of  $\frac{1}{4}'' = 1'-0''$  or larger, detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components (For all floor levels including all mechanical areas, penthouses, and roof plans. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work. The Mechanical Contractor will administer the effort of coordination between various trades. The coordination drawings will be prepared and reviewed approved by Engineer of Record and CxA before installation of any plumbing, sprinkler, mechanical or electrical work and will be shown as a task on the Project Schedule to be prepared by the General Contractor.

### **1.9 WORKMANSHIP**

- A. Workmen to be thoroughly experienced and fully capable of installing assigned work. Work to be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner and as approved.
- B. All material and equipment to be installed in accordance with manufacturer's printed recommendations (using recommended accessories) and/or as approved by the Designer. Retain a copy on job site and submit others for approval when required.

## **PART 2 - PRODUCTS**

This Part Not Used.

## **PART 3 - EXECUTION**

### **3.1 LEED PROJECT REQUIREMENTS**

- A. This is a LEED certified project. Refer to specification section 01 1010 Sustainable Design Requirements for additional information and contractor responsibilities.

### **3.2 SURFACE CONDITIONS**

- A. Inspection:
  - 1. Prior to any work, the Contractor shall carefully inspect the installed Work of all other Trades and verify that all such Work is complete to the point where his installation may properly commence.
  - 2. Verify that all equipment may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

### **3.3 INSTALLATION**

- A. Install all equipment and appurtenances in strict accordance with the manufacturer's recommendations.

### **3.4 COMMISSIONING REQUIREMENTS**

- A. This project will require commissioning support from the contractor to verify control sequences and test and balance data (include minimum of 5 days for controls technician and test and balance technician support; refer to specification 23 08 01-BAS SYSTEM COMMISSIONING for additional information).

### **3.5 REQUIREMENTS FOR OPERATING HVAC EQUIPMENT DURING CONSTRUCTION**

- A. Building must be fully enclosed, including installation of all doors, windows, etc.
- B. Set air handler to use 100% outside if construction is still generating dust and when conditions will not allow the coil to freeze.
- C. If return air is to be used then all exhaust and return ducts/grilles shall be covered with temporary filter media, minimum MERV 8, to prevent dust infiltration into the ducting.
- D. All chilled water piping shall be insulated.
- E. Pump and fans shafts shall be aligned prior to operation. Laser alignment shall be provided for pumps, and reports shall be furnished prior to operation.
- F. Supply and outside air connections of ductwork to AHUs shall be complete.
- G. All manual dampers, fire dampers and combination fire/smoke dampers shall be open.
- H. All main supply ductwork shall be insulated.
- I. All safety circuits and basic control functions shall be active and fully functional. If the equipment may operate without a fully functional BAS, then means to prevent damage to ducting due to closed dampers and means to prevent damage to freezing coils shall be provided. Blow-out doors may be used to protect ducting. Until TAB activities commence, fans and pumps shall operate at no more than 70% of estimated design capacity.
- J. Conditioning (cooling & dehumidifying) of the building shall remain once started.
- K. Final approval of Engineer and Owner are required prior to starting AHUs for temporary operation.
- L. Cover outside air intakes with 1" roll filter media.
- M. The contractor shall perform all required preventative maintenance on mechanical equipment operated during construction and provide documentation in the operation and maintenance manuals of preventative maintenance activities completed during this period.
- N. At the end of the construction period and prior to occupancy, clean the inside of AHUs and if more than 50% loaded, then install new pre and final filters.
- O. AHU UV lights shall be operational, and all specified filters installed during all AHU operation.

### **3.6 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT**



- A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, the Contractor shall repair or replace damaged items as determined by the Architect/Engineer, at no cost to the Owner.
- B. Damage from rain, dirt, sun, and ground water shall be prevented by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.
- C. Piping shall be protected by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation in the piping.
- D. During construction cap the top of all ductwork and piping installed vertically.
- E. Periodically during construction and prior to Owner acceptance of the building, Contractor shall remove from the premises and dispose of all packing material and debris. All adjacent occupied areas shall be cleaned daily to remove dirt and debris resulting from this work.

### **3.7 WELDING AND PIPING PRESSURE TESTS**

- A. All welded piping shall be installed by Contractor using NCPWB or ASME Certified Welding Procedures. Welding shall comply with ANSI/ASME B31.1 and Section IX of the ASME Boiler and Pressure Code.
- B. All piping shall be hydrostatically tested for pressure of 1-1/2 times the working pressure of the line, but not less than 150 psig. This hydrostatic test shall be witnessed by the Designer.
- C. Ten days before any welded work is to start, the Contractor shall furnish the Designer copies of the welding procedures approved for the Contractor.
- D. Before any welder is put to work in welding any piping for this job, the Designer shall be furnished with duplicate copies of the certification of each welder. If, in the opinion of the Designer, the welding is not done properly, a coupon shall be cut from field welds for inspection and/or the welder may be required to pass a recertification test. Costs of cutting the coupon shall be the responsibility of the Contractor. Also, all welds shall be subject to non-destructive x-ray examination by Owner. Contractor will be responsible for all costs of non-destructive x-ray examination, including all remedial repair work and retesting of welding that is determined to be unsatisfactory.
- E. No welding is to be covered with insulation or concealed until the welding has been approved by the Designer as outlined above.
- F. All welding operations shall be approved by the Designer prior to beginning work. Extreme care shall be exercised to prevent damage to the existing buildings or building or surrounding contents during welding operations.
- G. During welding of all piping, contractor shall use fire resistant or equal pad protection to prevent scorching or burning of existing floor and wall finishes, etc. Also, care shall be taken to eliminate sparks from dropping on existing furniture, equipment, and flooring material. All damages created by welding flame or sparks shall be repaired to owner's satisfaction at contractor's expense.
- H. All welding shall be done in such a manner as to prevent welding fumes to enter other areas of the building and shall be coordinated with the owner to assure that it does not interfere with normal building operations while the building is occupied.

### **3.8 SUBSTITUTION OF EQUIPMENT**

- A. Requests for substitutions of products may be made during the bidding period by submitting completed substitution request accompanied by information sufficient for the Engineer to make a determination as to the equivalency of a product.
- B. The Engineer will consider requests utilizing this section for substitution of products in place of those specified.

- C. Submit 14 calendar days prior to Bid Date. No substitutions will be reviewed or accepted after this date unless there is an obvious advantage to the Owner.
- D. Substitution requests may be submitted by U.S. Postal Service.
- E. Prime Bidders shall request a substitution on the letterhead stationery of the Prime Bidder submitting the request. Requests from individual manufacturers will not be accepted.
- F. Submit separate request for each substitution. Support each request with the following information. All items must be addressed.
- G. Complete data substantiating compliance of proposed substitutions with requirements stated in Contract Documents:
  - 1. Product identification, including manufacturer's name and address.
  - 2. Manufacturer's literature, identifying:
    - a. Product description
    - b. Reference standards.
    - c. Performance and test data.
  - 3. Name and address of similar projects on which product has been used and date of each installation.
  - 4. Itemized comparison of the proposed substitution with product specified, listing significant variations.
  - 5. Data relating to changes in construction schedule, if any.
  - 6. All effects of substitution on separate contracts.
  - 7. List of changes required in other work or products.
  - 8. Designation of availability of maintenance services and sources of replacement parts.
- H. Substitutions will not be considered for acceptance when:
  - 1. Acceptance will require substantial revision of Contract Documents.
  - 2. In judgment of Engineer, substitution request does not include adequate information for a complete evaluation.
  - 3. Requests for substitutions not submitted by a Prime Bidder.
  - 4. Where the effect on the schedule will be negative.
- I. In making formal request for substitution, the Prime Bidder represents that:
  - 1. The Prime Bidder has investigated proposed product and has determined that it is equivalent to or superior in all respects to that specified.
  - 2. The Prime Bidder will provide the same warranties or bonds for substitution as for product specified.
  - 3. The Prime Bidder will coordinate installation of accepted substitution into the Work and will make such changes as may be required for the Work to be complete in all respects.

### **3.9 SUBMITTALS**

- A. Refer to Division 1, as available, for information on submittal requirements. When conflicts exist, Division 1 shall apply.
- B. The terms "Submittals" can generally be used to indicate any information which is required to be reviewed by the A/E before further action on that product can be taken by the Contractor. This may include product data sheets, shop drawings, and schedules.

- C. Submittals generally not required when equipment is purchased exactly as specified and scheduled. Submit list of such equipment only. Equipment data sheets must be included in project manual prepared for Owner.
- D. Submittals shall be searchable format, preferably pdf.

**3.10 PRODUCT SUBMITTALS**

- A. The following product data information shall be submitted:

Section	Title
230100	MECHANICAL GENERAL
230200	MECHANICAL RELATED WORK
230300	ELECTRICAL WORK FOR MECHANICAL SYSTEMS
230500	FIRESTOPPING AND WATERPROOFING
230510	GAGES AND METERS
230513	ADJUSTABLE FREQUENCY DRIVES
230529	SUPPORTS AND ANCHORS
230548	VIBRATION ISOLATION AND SEISMIC RESTRAINTS
230553	MECHANICAL IDENTIFICATION
230593	TESTING, ADJUSTING, AND BALANCING
230700	INSULATION
230013	INSTRUMENTATION AND CONTROL DEVICES
230923	BUILDING AUTOMATION SYSTEM
230900	BUILDING AUTOMATION SYSTEM
230910	BAS FIELD DEVICES
230920	BAS COMMUNICATION AND WIRING
230930	BAS I&C DEVICES FOR HVAC
230940	BAS SOFTWARE AND GRAPHICAL USER INTERFACE
230950	BAS ALARMING AND REPORTING
230960	BAS POINT STRUCTURING AND NAMING
230970	BAS TRENDING
230990	BAS FAULT DETECTION / DIAGNOSTICS AND UTILITY ANALYSIS
232113	HYDRONIC PIPING
232116	HYDRONIC SPECIALTIES
232123	PUMPS
232213	STEAM AND CONDENSATE PIPING
232216	STEAM AND CONDENSATE SPECIALTIES
232300	REFRIGERANT AND CONDENSATE PIPING AND FITTINGS
232310	PIPING SPECIALTIES – REFRIGERATION
232500	CHEMICAL WATER TREATMENT
233100	DUCTWORK
233300	DUCTWORK ACCESSORIES

233400	POWER VENTILATORS
233600	AIR TERMINAL UNITS
233700	AIR OUTLETS AND INLETS
235234	CONDENSING BOILERS
235235	VERTICAL TUBELESS STEAM BOILERS
236412	WATER COOLED CHILLER
236413	CHILLER EQUIPMENT ROOM
236500	INDUCED DRAFT COOLING TOWERS
236510	CENTRIFUGAL SOLID SEPARATOR
237300	MODULAR AIR HANDLING UNITS
237313	MEDIUM PRESSURE CUSTOM AIR HANDLING
238113	TERMINAL HEAT TRANSFER UNITS
238123	COMPUTER ROOM AIR CONDITIONING UNITS
238126	SPLIT SYSTEM UNITS

### **3.11 TEST AND REPORT SUBMITTALS**

- A. The following list may be used as a checklist for the contractor and A/E. All tests may not be listed:
  - 1. Test:
    - a. Underground and Aboveground HVAC piping
    - b. Duct pressure test.
    - c. System start up.
    - d. Test and Balance Agency Construction Report.
    - e. All required test reports.
    - f. Boiler inspection.
    - g. Gas piping pressure test.
    - h. Required Pressurization Systems.

### **3.12 FIRE PENETRATION SYSTEMS SUBMITTAL**

- A. Each type of system penetrating a fire rated assembly shall be identified by the Contractor. The Contractor shall demonstrate his understanding of fire stop systems by the following.
- B. Submit 3/4-inch scale drawings of each assembly indicating type penetrations, slab, floor, wall or roof system, fire stop materials used, thickness and all other pertinent details. Submittal shall be neatly and accurately drafted.
- C. Each type of system penetrating a fire rated assembly shall be identified by the Contractor. Provide approved installation details with agency approval indicated thereon.

### **3.13 RECORD DRAWINGS**

- A. The Contractor shall keep a record set of drawings on the job and, as construction progresses, shall show the actual installed location of all items, material, and equipment of these job drawings.
- B. At the time of final inspection, two corrected sets of prints and sepias shall be delivered to the Designer. All drawing costs to be paid by the Contractor.

- C. Sepias shall be corrected deleting incorrect locations and showing installed locations in accordance with information transferred from job drawing.
- D. Qualified draftsmen shall perform this task.

### **3.14 OPERATION AND MAINTENANCE MANUALS**

- A. The Contractor shall compile and bind three (3) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. An electronic PDF copy of the O&M manuals shall also be provided and shall have searchable text.
- B. The manuals shall comply with specifications in this section in addition to specifications in other mechanical specifications as well.
- C. Binder shall be hard cover, three-ring notebook, 11" x 8-1/2" with heavy duty rings. Maximum binder size shall be 2-1/2".
- D. The front of the binder shall be titled "Mechanical Operating and Maintenance Instructions," with the name of the job and documents date under the title.
- E. Operating and Maintenance Instructions shall include the following:
  - 1. A sheet in each binder listing the architect, engineer, and all contractors. List addresses and phone numbers.
  - 2. List name, address, and phone number of organization responsible for warranty work if other than contractor and the specific work for which he is responsible.
  - 3. List name, address and phone number of the nearest sales and the nearest service organization for each product.
  - 4. Schedules of all equipment indicating identification number shown on plans cross referenced to field applied identification tag number.
  - 5. Performance Curves: For pumps, balance valves and similar equipment at the operating conditions.
  - 6. Lubrication Schedule: Indicating type and frequency of lubrication required.
  - 7. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.
  - 8. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
  - 9. Instruction Books: May be standard booklets but shall be clearly marked to indicate applicable equipment and characteristics.
  - 10. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.
  - 11. Automatic Controls: Diagrams and functional descriptions.
  - 12. Test and Balance Reports.
  - 13. Valve tag list: Identifying valve type, size, service, and general location.
  - 14. Filter schedule: Identifying filter type, size efficiency, manufacturer, and equipment number.
  - 15. Ceiling marker schedule.
- F. The following diagrams, schematics and lists shall be framed under glass and hung adjacent to equipment, in mechanical rooms, or where directed by Owner:
  - 1. Automatic control diagrams.
  - 2. Sequence of operation.

3. Valve Tag List.

**3.15 OPERATIONAL AND MAINTENANCE INSTRUCTION**

- A. After all final tests and adjustments have been complete, a competent employee of the Contractor shall be provided to instruct the Owner's Representative in all details of operation and maintenance for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time after instructions to assure that Owner's Representative is qualified to take over operation and maintenance procedures. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive. Minimum instruction periods shall be as follows:
1. Air handling units, Chilled Water, Hot Water, and Steam Systems (1 working day).
  2. Air distribution system and Exhaust Systems (1/2 working day).
  3. Split Systems (1/2 working day).
- B. Instruction period shall be performed prior to final acceptance at time periods as approved by Owner.

**3.16 CONTROLS OPERATION AND MAINTENANCE INSTRUCTION**

- A. Upon completion of Operation and Maintenance instructions, competent employees of the Control Contractor shall be provided to instruct the Owner's representative in all details of operation and maintenance for the controls installed. Supply qualified personnel to operate system for sufficient length of time after instructions to assure the Owner's Representative is qualified to take over operation and maintenance procedures.
- B. Controls Operation and Maintenance Instruction shall include the entire control system including control sequences that are inherent to equipment provided by the Equipment Manufacturer including economizer cycles, burner operation, low ambient operation, freezestats and similar sequences. Contractor shall provide sufficient personnel equipment walkie-talkies, gauges, and other accessories for this work.
- C. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive. Minimum instruction periods shall be one (1) working day for on-site training.
- D. Instructional period shall be performed prior to final acceptance at time periods as approved by Owner. One (1) day of instructions shall be in a formal classroom setting as determined by the owner.
- E. Classroom instructions shall be videotaped by the Contractor. A copy of each tape shall be provided to the Owner. Contractor shall be responsible for all equipment, tapes, and accessories required.

**3.17 GENERAL COMPLETION AND DEMONSTRATION**

- A. Results Expected:
1. All systems and controls shall be complete, tested, and operational.
  2. All start-up and testing and balancing shall be complete.
  3. All equipment shall be thoroughly cleaned. All excess materials and all debris shall be removed from the site.
  4. All walls, floors, ceilings, and other surfaces marred or otherwise damaged as a result of execution of this contract shall be cleaned and repaired to the satisfaction of the Designer and Owner.

**END OF SECTION 23 0100**

**SECTION 23 0200**  
**MECHANICAL RELATED WORK**

**PART 1 - GENERAL REQUIREMENTS**

**1.1 DRAWINGS AND SPECIFICATIONS**

- A. Provide all materials called for in these specifications and accompanying drawings and provide the apparatus complete in every respect. Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be provided.
- B. Where there is a discrepancy between drawings and specifications, the worst case shall be assumed.
- C. Drawings show arrangements of system desired and shall be followed as closely as practical. Because of the small scale of the drawings not all offsets and bends can be shown, and these shall be provided as required, to fully complete the intent of plans. Should conditions and substitutions of equipment necessitate a rearrangement, prepare, and submit for review scaled drawings of such rearrangement, before beginning work.
- D. Verify and check all measurements in the field.
- E. Review architectural, structural, and electrical plans, and cooperate and coordinate work with other trades to the extent that interference shall be avoided. Discrepancies shown on different plans, or between plans and specifications, shall promptly be brought to the attention of the Designer.

**1.2 CONCEALMENT OF PIPE AND DUCTS**

- A. Chases and Holes: Unless otherwise indicated, all piping and ductwork shall be run in concealed spaces between floor and ceilings or in chases. Ductwork and piping areas without ceilings shall be installed, exposed and as high as practical. This Contractor shall be responsible for the location and size of holes required for pipe, ducts and other equipment and shall advise of chase spaces and holes required as building progresses. Failure to do so shall require this Contractor to provide or cut same.

**1.3 CUTTING AND PATCHING**

- A. This Contractor must have an experienced Mechanic upon the job before concrete floors, concrete or masonry walls are set in place, whose duty it shall be to locate the exact position of any and all sleeves and holes for the future installation of his pipe or duct work. This Contractor shall locate and size all openings required for his equipment in time to not delay the building construction.
- B. If it becomes necessary to cut holes in concrete floors or concrete or other masonry walls, this Contractor shall call the General Contractor or his superintendent of Construction and inform him of the position and size of the hole or other opening to be provided and the General Contractor shall determine how this will be done. Under no condition shall this Contractor make any cuts without permission from the General Contractor, nor shall he cut any green floors or walls.
- C. This Contractor shall arrange proper openings in the building to admit his equipment. If it becomes necessary to cut any portion of the building to admit any equipment or install mechanical systems, this Contractor shall be responsible for cutting and patching. The portions cut must be restored to their former condition by this Contractor.
- D. All cutting of structure shall be done using best method to minimize noise and cracking of structure. The method of cutting shall be approved by the Project Expediter (Prime Contractor) before work is started.

- E. All drilled holes required for equipment or supports shall be done by this Contractor. Holes for piping shall be core drilled only.

#### **1.4 EQUIPMENT STANDS, FOUNDATIONS AND MISCELLANEOUS STEEL FOR HANGERS AND SUPPORTS**

- A. Provide all equipment stands and supports for equipment as shown or required. Provide miscellaneous steel for hanging piping, ducts or other items of equipment as shown as required.
- B. All concrete foundations, curbs and pads for equipment, ductwork, piping, etc. shall be provided by this Contractor, unless otherwise indicated. Pads shall be provided for all floor standing equipment.
- C. All stands shall be adequately cross braced to provide rigid supporting foundation. All stands shall be adequately anchored to wall or floor as required. All miscellaneous steel shall have one coat of shop paint and two finished coats of rust resistant paint.

#### **1.5 SITE EXAMINATION**

- A. Contractor, prior to submitting a bid, shall visit the site and thoroughly acquaint himself with the conditions under which the work will be performed.

#### **1.6 PAINTING**

- A. Work to be Painted:
  - 1. All piping, ductwork, conduit, steel supports, hangers, and other mechanical items exposed to view in occupied areas shall be painted under Division 09 by General Contractor.
  - 2. All insulated piping as noted in Section 23 0700, uninsulated piping, ductwork, supporting steel and hangers for piping, ductwork and equipment (except made of galvanized steel) shall be shop coated with rust proof primer and shall be field painted by Mechanical Contractor except where installed above ceilings or where concealed in building construction. Concealed supports and hangers do not require painting.
  - 3. All exposed insulated and uninsulated piping and ductwork in Mechanical Room shall be painted by Mechanical Contractor with (2) coats of paint.
  - 4. All areas where cutting and patching are required the mechanical contractor shall paint to match adjacent surfaces.
- B. Work not requiring Painting:
  - 1. Piping and ductwork above solid (lay-in, gypsum board, etc.) ceilings do not require painting.
  - 2. All exposed items specified to be finished by manufacturer will not be painted. See "Manufacturers' Finished Products".
- C. Manufacturers' Finished Products:
  - 1. All manufacturer finished products, such as water pumps, fans, air handling units, control panels, etc., shall have factory standard finish except where otherwise specified on the drawings or in other sections of this specification.
  - 2. Contractor providing finished products shall be required to touch up any minor damages or scratches due to shipment, installation, or exposure to weather on all equipment with baked enamel or equivalent finish, Prime coated equipment shall be cleaned and touched up. Large areas of damaged finish shall be painted to match factory painting.
- D. Refer to Division 09 for painting requirements

### **PART 2 - PRODUCTS**

#### **2.1 ROOF CURBS AND EQUIPMENT SUPPORTS**



- A. See notes on plans for supports provided by others.
- B. **Manufactured Equipment:** Furnish all rooftop type manufactured equipment with a prefabricated roof curb designed to support the equipment. The equipment base shall overhang the curb and act as a cap flashing. Where required, curb shall be designed for sloping roof.
- C. **Curbs:** Curbs shall be prefabricated metal roof curbs constructed using minimum 18 gage thick galvanized steel minimum 14 gage galvanized steel with any side longer than 48", with fully mitered and welded corners, integral base plate with minimum 3/4" exterior flange and unobstructing interior edge, 1/2" thick 3 lbs/sq. ft. density rigid interior fiber glass insulation and pressure treated wood nailers.
  - 1. Roof curbs shall have 45-degree cant.
  - 2. Minimum height of curbs shall be 12" above the finished roof.
  - 3. Roof curbs shall be constructed to match roof deck slope to create a level top surface.
  - 4. Roof curbs shall have an internal flange suitable for damper installation, where applicable.
  - 5. Roof curbs shall have an ABS thermoplastic cap with integral graduated step boots for pipe and round duct penetrations. Include adjustable stainless-steel clamps, 2 per boot. Refer to drawings for pipe sizes and quantities.
- D. **Equipment Supports:** Supports shall be prefabricated metal curb supports constructed of minimum 1.9 mm (14 gage) thick galvanized steel with fully mitered and welded corners, integral base plate with minimum 3/4" flange, pressure treated top wood nailer, and 18 gage thick galvanized steel counterflashing cap.
  - 1. Supports shall be 45-degree cant.
  - 2. Minimum height shall be 12" above the finished roof.
  - 3. Supports shall be constructed to match roof deck slope to create a level top surface.

### **PART 3 - EXECUTION**

#### **3.1 FORMWORK**

- A. **General:** Design, construct and maintain formwork to support vertical and lateral loads including pressure of cast-in-place concrete. Construct formwork so that formed concrete will be required size and shape and in required location. Construct with joints which will not leak cement paste. Form side and bottoms of concrete work, except where clearly indicated to be cast directly in excavation or against other construction, or on grade or prepared subgrade. Design and construct forms for easy removal without damage to concrete and other work.
- B. **Form Costing:** Cost concrete-contact surfaces of forms to be removed. Apply form-coating compound before reinforcement is placed. Apply in accordance with manufacturer's instructions and remove excess compound and spillage.
- C. Deposit concrete continuously or in layers of thickness which will result in no concrete being placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within section. If section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable in its final location, so as to avoid segregation due to rehandling or flowing.
- D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures complying with recommended practices of ACI 309; eliminate voids in work.
- E. Bring horizontal surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps and hollows.

- F. Cold Weather Placement: Comply with ACI 306. Do not use frozen materials or materials containing ice and snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. When air temperature has fallen or is expected to fall below 40 degrees F, heat water and aggregates uniformly before mixing, as required to obtain concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F, at time of placement. Protect concrete work from physical damage and reduced strength resulting from frost, freezing actions, or low temperatures.

**END OF SECTION 23 0200**

**SECTION 23 0500**  
**FIRESTOPPING**

**PART 1 - GENERAL REQUIREMENTS**

**1.1 SCOPE OF WORK**

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the patching and repair of building structure, finishes and building assemblies as specified hereinafter.
2. Furnish all labor, materials, tools, and equipment and perform all penetrations in connection with the installation of fire stopping and smoke stopping systems required to seal all penetrations of required rated partitions, walls, or assemblies for Division 23 work.

B. Descriptions:

1. Patch and repair all building finishes, structural components, or other appurtenances that are removed or damaged as a result of the performance of this contract. Patch and repair work shall include finishes, components, substructure, and materials required for the installation of such work in accordance with standard practices.
2. All penetrations through exterior walls, floors, and roof systems shall be sealed watertight.
3. Firestop all existing openings in walls, roofs, slabs, and similar assemblies remaining as a result of removing existing pipes, ducts, conduit, equipment appurtenances.
4. Firestop and Smokestop as required for assembly type all new openings in walls, roofs, slabs and similar assemblies at pipe, duct, conduits, equipment, and appurtenances.
5. Patched and repaired work shall be finished to match existing or adjacent construction and conditions.

**1.2 QUALITY ASSURANCE**

A. Materials:

1. Materials shall be new, unused, properly stored and matching existing in colors, texture, finish, appearance, and function.
2. Fire stopping and smoke stopping materials shall be delivered to the job site ready to install and require no critical mixing procedures or precise installation time constraints.
3. Materials shall be delivered to the site in sealed containers, fully identified with manufacturer's name, brand, type, grade and U.L. and FM labels. Store materials in a dry space under cover and off the ground.
4. Products shall be applied in strict accordance with their listing and manufacturers' application requirements.

B. Code and Standards: All work shall meet or exceed the standards and procedures (latest editions) of the following:

1. ASTM E814, Fire Tests of Through-Penetration Firestop Systems.
2. UL 1479, Through-Penetration Firestop Systems.

C. Manufacturer: The following firestopping and waterproofing sealant manufacturers are acceptable:

1. Nelson.

2. Thomas & Betts.
  3. 3M.
  4. Hilti.
  5. GE.
  6. Frye Putty.
- D. The following smoke stopping manufacturers are acceptable:
1. Nelson.
  2. Thomas & Betts.
  3. 3M.

## **PART 2 - PRODUCTS**

### **2.1 FIRESTOPPING**

- A. Firestopping material shall maintain its dimension and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and use when exposed to the ASTM E119 time-temperature rating of the assembly penetrated.
- B. All material shall be listed by U.L.

### **2.2 SMOKESTOPPING**

- A. Smoke-stop shall provide an effective barrier against the spread of smoke.
- B. All material shall be listed by U.L.

### **2.3 WATERPROOFING**

- A. Sealant materials shall be as follows:
  1. Penetrations of Fire Rated assemblies shall meet the requirements of 2.1 FIRESTOPPING specified hereinbefore.
  2. Exterior joint sealant shall be Polyurethane base, multi-component; self-leveling type for application in vertical joints; capable of withstanding movement of up to 50% of joint width and satisfactorily handled throughout temperature of 4 to 27 degrees C.; uniform, homogeneous, and free from lumps, skins and coarse particles when mixed; Shore "A" hardness of minimum 15 and maximum 50; non-staining; non-bleeding; colors selected by Architect/Engineer.

### **2.4 SUBMITTAL**

- A. Provide U.L. approval assembly detail for specific application of the product.
- B. Provide installation detail of the product.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Exercise care in the performance of this contract so as not to damage any existing building components and finishes, outside components, shrubs, or other appurtenances.
- B. Clean and prepare joints for sealant application in accordance with manufacturer's recommendations. Ensure that joint forming materials are compatible with sealant.
- C. Openings larger than required for proper installation of pipe or duct shall be patched or repaired.
- D. Protect the roof at all times. Provide planking, plywood, supports, and other materials and means to ensure damage is not incurred.
- E. Firestopping and smoke stopping will meet the U.L. approved assembly detail for the product used.

**3.2 EQUIPMENT PENETRATIONS:**

- A. Seal all openings into equipment resulting from installation of equipment such as piping and conduit.
- B. Repair all insulation damaged during installation of equipment.

**END OF SECTION 23 0500**

**SECTION 23 0529  
SUPPORTS AND ANCHORS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Pipe and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks

**1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION**

- A. Placement of inserts sleeves in existing walls and slabs.
- B. Placement of roofing duct supports.
- C. Placement of equipment roof supports.
- D. Placement of roof sleeves, vents, and curbs.

**1.3 REFERENCES**

- A. ASME B31.1 - Power Piping.
- B. ASME B31.2 - Fuel Gas Piping.
- C. ASME B31.5 - Refrigeration Piping.
- D. ASME B31.9 - Building Services Piping.
- E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- I. NFPA 13 - Installation of Sprinkler Systems.
- J. NFPA 14 - Installation of Standpipe and Hose Systems.
- K. UL 203 - Pipe Hanger Equipment for Fire Protection Service.

**1.4 SUBMITTALS**

- A. Submit under provisions of Division 1.
- B. Product Data: Provide manufacturers catalog data including load capacity.
- C. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- D. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

**1.5 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for support of hydronic piping.

**PART 2 - PRODUCTS**

**2.1 PIPE HANGERS AND SUPPORTS**

- A. Pipe hangers for insulated piping shall be sized to fit around the pipe covering. Contractor shall provide at each hanger a galvanized insulation protection shield formed to fit the outside of the covering. Shield shall extend above center line on both sides. Shield to be #18 gauge up to 3"

pipe, #16 gauge up to 6" pipe and #14 gauge for 8" and larger. Provide rigid insulation under all hangers. See Section 23 0700, Insulation.

**B. Hydronic Piping:**

1. Conform to MSS SP58.
2. Hangers for Pipe Sizes 1/2 to 1 1/2 Inch (13 to 38 mm): Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast-iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

**2.2 ACCESSORIES**

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

**2.3 FLASHING**

- A. Metal Flashing: 26 gage galvanized steel.
- B. Metal Counterflashing: 22 gage galvanized steel.
- C. Lead Flashing:
1. Waterproofing: 5 lb/sq ft (24.5 kg/sq m) sheet lead.
  2. Soundproofing: 1 lb/sq ft (5 kg/sq m) sheet lead.
- D. Flexible Flashing: 47mil thick sheet compatible with roofing.
- E. Caps: Steel, 22 gage (0.8 mm) minimum; 16 gage (1.5 mm) at fire resistant elements.

**2.4 EQUIPMENT CURBS**

- A. Fabrication: Welded 18 gage (1.2 mm) galvanized steel shell and base, mitered 3 inch (75 mm) cant, variable step to match root insulation, 1-1/2 inch thick insulation, factory installed wood nailer, sloping base to match sloping roof where required.

## **2.5 SLEEVES**

- A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage (1.2 mm thick) galvanized steel.
- B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Galvanized steel.
- E. Sleeves for Rectangular Ductwork: Galvanized steel.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

### **3.2 INSERTS**

- A. Provide inserts for placement in concrete walls and slabs as noted on plans.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

### **3.3 PIPE HANGERS AND SUPPORTS**

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 1/2-inch (13 mm) space between finished covering and adjacent work.
- C. Place hangers within 12 inches (300 mm) of each horizontal elbow.
- D. Use hangers with 1 1/2 inch (38 mm) minimum vertical adjustment.
- E. Support vertical piping at every floor.
- F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.
- H. Provide copper plated hangers and supports for copper piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Prime coat exposed steel hangers and supports. Refer to Division 9. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

### **3.4 EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete, minimum 6 inches thick and extending 6 inches (150 mm) beyond supported equipment. Refer to Division 3.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

### **3.5 FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches (75 mm) minimum above finished roof surface with lead worked one inch (25 mm) minimum into hub, 8 inches (200 mm) minimum clear on sides



with 24 x 24 inches (600 x 600 mm) sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash, and seal.

- C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.
- D. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints. Roof curbs shall be constructed to match the roof slope so the equipment will be installed level with the ground.
- E. Adjust storm collars tight to pipe with bolts, caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

**3.6 SLEEVES**

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping material and caulk as per UL approved detail. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

**3.7 SCHEDULES**

	<b>Pipe Size Inches</b>	<b>Max Hanger Spacing Feet (m)</b>	<b>Hanger Rod Diameter Inches (mm)</b>
1.	1/2 to 1-1/4	6.5 (2)	3/8 (9)
2.	1-1/2 to 2	10 (3)	3/8 (9)
3.	2-1/2 to 3	10 (3)	1/2 (13)
4.	4 to 6	10 (3)	5/8 (15)
5.	8 to 12	12 (3.7)	7/8 (22)

**END OF SECTION 23 0529**

**SECTION 23 0553  
MECHANICAL IDENTIFICATION**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES:**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Ceiling Tacks.

**1.2 REFERENCES**

- A. ASME A13.1 Scheme for the Identification of Piping Systems.

**PART 2 - PRODUCTS**

**2.1 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

**2.2 TAGS**

- A. Metal Tags: Brass with stamped letters; tag size minimum 1 1/2-inch diameter.
- B. Chart: Typewritten letter size list in 3-ring notebook.

**2.3 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1 1/4 inch Outside Diameter of Insulation or Pipe: 8-inch-long color field, 1/2-inch-high letters.
  - 2. 1 1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8-inch-long color field, 3/4-inch-high letters.
  - 3. 2 1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12-inch-long color field, 1 1/4-inch-high letters.
  - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24-inch-long color field, 2 1/2-inch-high letters.
  - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32-inch-long color field, 3 1/2-inch-high letters.
  - 6. Ductwork and Equipment: 2 1/2-inch-high letters.
- B. Stencil Paint: Semi-gloss enamel, black on white background conforming to ASME A13.1.

**2.4 CEILING TACKS**

- A. Description: Steel with 3/4-inch diameter color coded head; In addition, provide clear plastic label adjacent to ceiling tack indicating specific equipment identification tag.
- B. Color code as follows:
  - 1. Yellow - HVAC equipment.
  - 2. Red - Fire dampers/smoke dampers.
  - 3. Green - Plumbing valves.
  - 4. Blue - Heating/cooling valves.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Reference division 9 for surface preparation.

**3.2 INSTALLATION**

- A. All equipment requiring periodic maintenance or testing located in concealed spaces shall be clearly identified on an adjacent finished surface to identify the location of equipment. For equipment mounted above ceilings, provide an ID label on the ceiling below the equipment. Typical concealed equipment includes air terminals, air valves, PRVs, mixing valves, duct and pipe differential pressure sensors, steam traps, fire smoke dampers, etc. Labels shall be clear or white with 0.375" high black letters.
- B. Install plastic nameplates with corrosive resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- C. Install tags with corrosion resistant chain.
- D. Reference division 9 for surface preparation. Black on white background or color as coordinated with Engineer and Owner prior to beginning work.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats relating to terminal boxes or valves with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify air terminal units and associated valves with numbered tags.
- K. Tag automatic controls, instruments, and relays. Key to control schematic.
- L. Identify piping, concealed, or exposed, with stencils. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- M. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- N. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 23 0553**

**SECTION 23 0593**

**TAB**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic steam systems.
- C. Measurement of final operating condition of HVAC systems.

**1.2 ALLOWANCES**

- A. Work is included in this section and is part of the Contract Sum/Price.

**1.3 REFERENCES**

- A. AABC - National Standards for Total System Balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

**1.4 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of flow and pressure measuring stations and balancing valves.

**1.5 QUALIFICATIONS**

- A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum five years documented experience certified by AABC.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, or registered Professional Engineer experienced in performance of this Work and licensed in the State of North Carolina.

**1.6 PRE-BALANCE CONFERENCE**

- A. Convene one month prior to commencing work. Include all pertinent contractors and designers.

**1.7 SEQUENCING**

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- B. The test and balance report shall be completed, reviewed, and approved by project engineer prior to final inspection and occupancy. Preliminary/rough draft reports are not acceptable.

**1.8 SCHEDULING**

- A. Schedule and provide assistance in final adjustment and test of life safety and lab exhaust system.

**PART 2 - PRODUCTS – This Part Not Used.**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed, and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted.

C. Beginning of work means acceptance of existing conditions.

### **3.2 PREPARATION**

A. Provide instruments required for testing, adjusting, and balancing operations. Make technician and instruments available to Designer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

### **3.3 INSTALLATION TOLERANCES – CHECK AND SELECT APPROPRIATE TAB TOLERANCES HERE.**

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for air conditioning systems and plus or minus 5 percent of design for exhaust systems.

B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

C. Where pressure relationship between adjacent spaces is called for, document compliance.

### **3.4 ADJUSTING**

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

### **3.5 AIR SYSTEM PROCEDURE**

- A. For laboratory spaces, the transfer airflow rates listed on the plans are preliminary values. The Contractor shall adjust as necessary such that laboratory spaces are pressurized (either positive or negative) according to the intent shown on the drawings.
- B. Adjust air handling and distribution systems to provide required air quantities.
- C. Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.
- D. Measure air quantities at air inlets and outlets.
- E. Adjust distribution system to obtain uniform space temperatures control.
- F. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct mounted devices.
- G. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- H. Provide system schematic with required and actual air quantities recorded at each outlet or inlet. Provide summary report with all test and equipment data included.
- I. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- J. Adjust automatic, outside air, return air, and exhaust dampers for design conditions.
- K. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- L. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- M. Measure building and/or system static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximate positive static pressure called for.
- N. Check all motorized dampers for leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- O. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

### **3.6 WATER SYSTEM PROCEDURE**

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on suitable temperature difference.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### **3.7 SCHEDULES**

- A. Equipment Requiring Testing, Adjusting, and Balancing:

1. Chillers.
  2. Boilers.
  3. Heat Exchangers.
  4. Pumps.
  5. Air Coils.
  6. Terminal Heat Transfer Units.
  7. Air Handling System.
  8. Airflow Measuring Stations.
  9. Fans.
  10. Air filters.
  11. Air Terminal Units.
  12. Air Inlets and Outlets.
  13. Duct Leakage Testing.
- B. Report Forms:
1. Title Page:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.
    - e. Project location.
    - f. Project Architect.
    - g. Project Engineer.
    - h. Project Contractor.
    - i. Project altitude.
    - j. Report Date.
  2. Summary Comments:
    - a. Design versus final performance.
    - b. Notable characteristics of system.
    - c. Description of systems operation sequence.
    - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization.
    - e. Nomenclature used throughout report.
    - f. Test conditions.
  3. Instrument List:
    - a. Instrument.
    - b. Manufacturer.
    - c. Model number.
    - d. Serial number.
    - e. Range.

- f. Calibration date.
4. Electric Motors:
  - a. Manufacturer.
  - b. Model / Frame.
  - c. HP / BHP.
  - d. Phase, voltage, amperage, nameplate, actual, no load.
  - e. RPM.
  - f. Service factor.
  - g. Starter size, rating, heater elements.
  - h. Sheave Make/Size/Bore.
5. V-Belt Drive:
  - a. Identification/Location.
  - b. Required driven RPM.
  - c. Driven sheave, diameter, and RPM.
  - d. Belt, size, and quantity.
  - e. Motor sheave diameter and RPM.
  - f. Center to center distance, maximum, minimum, and actual.
6. Pump Data:
  - a. Identification number.
  - b. Manufacturer.
  - c. Size/Model.
  - d. Impeller.
  - e. Service.
  - f. Design flow rate, pressure drop, BHP.
  - g. Actual flow rate, pressure drop, BHP.
  - h. Discharge pressure.
  - i. Suction pressure.
  - j. Total operating head pressure.
  - k. Shut off, discharge, and suction pressure.
  - l. Shut off, total head pressure.
7. Chillers, Boilers, and Heat Exchangers:
  - a. Identification number.
  - b. Location.
  - c. Service.
  - d. Manufacturer.
  - e. Model number.
  - f. Serial number.
  - g. Steam pressure, design and actual (Only for steam heat exchangers and boiler).
  - h. Primary water entering temperature, design and actual.



- i. Primary water leaving temperature, design and actual.
  - j. Primary water flow, design and actual.
  - k. Primary water pressure drop, design and actual.
  - l. Secondary water leaving temperature, design and actual.
  - m. Secondary water leaving temperature, design and actual.
  - n. Secondary water flow, design and actual.
  - o. Secondary water pressure drop, design and actual.
8. Cooling Coil Data:
- a. Identification number.
  - b. Location.
  - c. Service.
  - d. Manufacturer.
  - e. Air flow, design, and actual.
  - f. Entering air DB temperature, design and actual.
  - g. Entering air WB temperature, design and actual.
  - h. Leaving air DB temperature, design and actual.
  - i. Leaving air WB temperature, design and actual.
  - j. Water flow, design, and actual.
  - k. Water pressure drop, design, and actual.
  - l. Entering water temperature, design and actual.
  - m. Leaving water temperature, design and actual.
  - n. Saturated suction temperature, design and actual.
  - o. Air pressure drop, design and actual.
9. Heating Coil Data:
- a. Identification number.
  - b. Location.
  - c. Service.
  - d. Manufacturer.
  - e. Air flow, design, and actual.
  - f. Water flow, design and actual.
  - g. Water pressure drop, design and actual.
  - h. Entering water temperature, design and actual.
  - i. Leaving water temperature, design and actual.
  - j. Entering air temperature, design and actual.
  - k. Leaving air temperature, design and actual.
  - l. Air pressure drop, design and actual.
10. Air Moving Equipment:
- a. Location.
  - b. Manufacturer.

- c. Model number.
  - d. Serial number.
  - e. Arrangement / Class / Discharge.
  - f. Air flow - specified and actual.
  - g. Return air flow - specified and actual.
  - h. Outside air flow - specified and actual.
  - i. Total static pressure (total external) - specified and actual.
  - j. Inlet pressure.
  - k. Discharge pressure.
  - l. Sheave Make /Size / Bore.
  - m. Number of Belts / Make / Size.
  - n. Fan RPM.
11. Outside Air Data:
- a. Identification/Location.
  - b. Design air flow.
  - c. Actual air flow.
  - d. Design return air flow.
  - e. Actual return air flow.
  - f. Design outside air flow.
  - g. Actual outside air flow.
  - h. Return air temperature.
  - i. Outside air temperature.
  - j. Required mixed air temperature.
  - k. Actual mixed air temperature.
  - l. Design outside/return air ratio.
  - m. Actual outside/return air ratio.
12. Exhaust Fan Data:
- a. Location.
  - b. Manufacturer.
  - c. Model number.
  - d. Serial number.
  - e. Air Flow – specified and actual.
  - f. Total static pressure (total external), specified and actual.
  - g. Inlet pressure.
  - h. Discharge pressure.
  - i. Sheave Make / Size/ Bore.
  - j. Number of Belts / Make / Size.
  - k. Fan RPM.
13. Duct Traverse:

- a. System zone / branch.
  - b. Duct size.
  - c. Area.
  - d. Design velocity.
  - e. Design air flow.
  - f. Test velocity.
  - g. Test air flow.
  - h. Duct static pressure.
  - i. Air temperature.
  - j. Air correction factor.
14. Duct Leak Test:
- a. Description of ductwork under test.
  - b. Duct design operating pressure.
  - c. Duct design test static pressure.
  - d. Duct capacity, air flow.
  - e. Maximum allowable leakage duct capacity times leak factor.
  - f. Test apparatus:
    - 1) Blower.
    - 2) Orifice, tube size.
    - 3) Orifice size.
    - 4) Calibrated.
  - g. Test static pressure.
  - h. Test orifice differential pressure.
  - i. Leakage.
15. Air Monitoring Station Data:
- a. Identification/location.
  - b. System.
  - c. Size.
  - d. Area.
  - e. Design velocity.
  - f. Design air flow.
  - g. Test velocity.
  - h. Test air flow.
16. Flow Measuring Station:
- a. Identification/number.
  - b. Location.
  - c. Size.
  - d. Manufacturer.
  - e. Model number.

- f. Serial number.
  - g. Design flow rate.
  - h. Design pressure drop.
  - i. Actual / final pressure drop.
  - j. Actual / final flow rate.
  - k. Station calibrated setting.
17. Terminal Unit Data:
- a. Manufacturer.
  - b. Type, constant, variable, single, dual duct.
  - c. Identification/number.
  - d. Location.
  - e. Model number.
  - f. Size.
  - g. Minimum static pressure.
  - h. Minimum design air flow.
  - i. Maximum design air flow.
  - j. Maximum actual air flow.
  - k. Inlet static pressure.
18. Air Distribution Test Sheet:
- a. Air terminal number.
  - b. Room number/location.
  - c. Terminal type.
  - d. Terminal size.
  - e. Area factor.
  - f. Design velocity.
  - g. Design air flow.
  - h. Test (final) velocity.
  - i. Test (final) air flow.
  - j. Percent of design air flow.

**END OF SECTION 23 0593**

**SECTION 23 0700**  
**INSULATION**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Work required under this section consists of insulation for piping and duct system and equipment specified in Division 23.
- B. Provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.
- C. All pipe fittings, valves, and strainers to be insulated.
- D. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

**1.2 DEFINITIONS**

- A. Thermal resistance "R" values are expressed in units of "Hour-Degrees F-sq. ft./Btu per inch of Thickness" on a flat surface at a mean temperature of 75 degrees F unless noted otherwise.
- B. Thermal conductivity (K), the reciprocal of "R", btu per inch thickness/hr/ft2/degree.
- C. Insulation to consist of insulating material, jacket, mastic, and adhesive, either as a "system" or as an individual component when used separately.

**1.3 QUALITY ASSURANCE / CERTIFICATION**

- A. Unless noted otherwise, all insulation, adhesives, coatings, sealers, and tapes to have a flamespread rating of 25 or less and smoke development of 50 or less when tested in accordance with ASTM E-84, NFPA 225 AND UL 723.
- B. Apply insulation in a workmanlike manner using experienced, qualified tradesmen.
- C. Do not apply insulation until all pressure testing has been completed, inspected, and released or insulation application.
- D. Clean and dry surfaces prior to insulation application.
- E. Butt insulation joints firmly together; smoothly and securely install all jackets and tapes.
- F. Insulation jacket for duct, pipe, and equipment exposed to weather to be certified as self-extinguishing in less than 53 seconds when tested in accordance with ASTM D1692.
- G. Certify that all duct and piping insulation meets the minimum requirements of the current State Energy Code for New Building Construction.

**PART 2 - PRODUCTS**

**2.1 MATERIALS FOR PIPE AND EQUIPMENT**

- A. Provide factory premolded or shop mitered segment type insulation for pipe, fittings, and valves, unless otherwise noted.
- B. Fitting insulation to be of same thickness and material as adjoining pipe insulation.
- C. Cellular Glass (Foamglass):
  - 1. Product to be guaranteed by manufacturer to have continuous operational temperature limit of not less than 90 degrees F and minimum "R" value of 2.63.
  - 2. Provide Pittsburgh Corning "Foamglass" noncombustible factory-molded material.
  - 3. Provide factory applied pre-sized glass cloth jacket having an inside vapor barrier and white exterior color equivalent to Johns-Manville "Flame-Safe type "GVB".
  - 4. Provide for the following services:

- a. Under pipe saddles where compressible piping insulation is used (Fiberglass, flexible elastomeric).
  - b. At all penetrations of rated walls and floors with insulated piping services.
- D. Flexible Elastomeric:
1. Provide AP Armaflex manufactured by Armstrong or equivalent.
  2. Provide 2-pound density, fire-retardant polyolefin, flexible type insulation, pre-formed tubular for piping and sheet for equipment.
  3. Maximum water vapor transmission rate of 0.03 perms per inch and UV stabilized with a guaranteed outdoor life of 10 years.
  4. Product to have continuous operational temperature limit of not less than 210 degrees F and a minimum "R" value of 3.71.
  5. Provide white, self-seal Armaflex 2000 manufactured by Armstrong for 1/2-inch application thickness.
  6. Provide insulation for the following services:
    - a. Copper or steel moisture condensate drains: 1/2-inch thick.
    - b. Pump casings below 60o service: 1-1/2" thick.
    - c. Run-outs to terminal units and split systems: 1-1/2" thick.
- E. Glass Fiber:
1. Provide factory-formed, factory-jacketed "system" type fiberglass insulation.
  2. Jacket to be fiberglass reinforced, white kraft paper with aluminum foil vapor barrier.
  3. Insulation density to be not less than 3.5 pounds per cubic foot.
  4. Product to have continuous operational temperature limit of no less than 650 degrees F and a minimum "R" value of 4.00.
  5. Product to be equivalent to Manville "Micro-Lok 650" with Type AP jacketing. Applicable products manufactured by Certaineed, Knauf, Owens Corning or Blue Trymer 2000 are acceptable.
  6. Provide insulation for following services:
    - a. Heating hot water and low-pressure steam piping.
      - 1) 1-1/2-inch diameter and smaller hot water and steam piping: 1-1/2" thick.
      - 2) Above 1-1/2-inch hot water piping: 2" thick.
      - 3) Above 1-1/2-inch steam piping: 3" thick.
    - b. Domestic cold water make-up piping (inside building): 1/2- inch thick
    - c. Tanks: 2".
- F. Rigid Foam Insulation:
1. Insulation shall be polyisocyanurate foam or Styrafoam with a K value (90 days aged) of .20 at a mean temperature of 75 degrees F. Density shall be 2#/cu. ft., flame spread less than 30 and smoke density less than 150 in 4" thickness. Insulation shall not be used in plenums. All joints and seams shall be neatly sealed in place with Foster 95-50 vapor barrier adhesive.
  2. Valves and fittings shall be insulated with same material and to the same thickness as adjoining pipe. When insulating flanges and valve bodies, insulation shall extend a minimum of 1" beyond the end of the flange bolts and the bolt area shall be filled with fiberglass before molded insulation is applied.

3. Fill small voids with approved sealer before finish is applied.
4. Provide a one-piece Zeston type fitting jacket as recommended by the manufacturer for the applicable design conditions.
5. Clean and apply bitumen coating prior to applying rigid foam insulation.
6. Apply on:
  - a. Chilled Water piping: 1-1/2" thick.
  - b. Chilled water specialties, except those insulated with flexible foam: 1-1/2" thick.
  - c. Condenser Water Piping (Outside, above ground): 1" thick.
  - d. Make-up water and drain piping subject to freezing at cooling tower: 1" thick.

## 2.2 MATERIALS FOR DUCTS

### A. Blanket Type Insulation:

1. Provide minimum 1 pound per cubic foot density, flexible, factory reinforced glass fiber blanket with foil-faced, glass-fiber reinforced kraft vapor barrier jacket. Provide 1.5 pcf with vinyl jacket where noted.
2. Insulation to have a minimum installed "R" value of 3.92.
3. Product to be manufactured by Manville, or equivalent by Certainteed, Knoff, or Owens-Corning.
4. Provide glass fiber blanket insulation for the following:
  - a. Unlined hot air or cold air supply ducts concealed from view (except where noted otherwise): 2 inch thick.

### B. Glass fiber Board Type Insulation:

1. Provide minimum 3 pound per cubic foot density semi-rigid insulation with factory applied reinforced foil faced kraft vapor barrier glass fiber board "system" type insulation.
2. Insulating board to have a minimum "R" value of 4.34.
3. Product to be manufactured by Manville, or equivalent by Certainteed, Knoff, or Owens Corning.
4. Provide glass fiber board insulation for the following:
  - a. Ducts within equipment rooms and exposed to view: 1-1/2 inch thick.
  - b. Ductwork located outside of building or outside of building insulation system: 2-inch thick.
  - c. Unlined apparatus casing: 1-1/2 inch thick.

### C. Exhaust ductwork shall not be insulated.

## 2.3 ELECTRICAL HEAT TAPE

- A. Furnish and install electrical, self-regulating heat tape at locations indicated on drawings.
- B. Furnish Raychem XL-Trace Self-regulating type completed with splicers, connectors and other accessories.
- C. Unless otherwise noted, provide the following minimum heat densities:
  1. Outdoor condenser water piping (including centrifugal separator piping): 5 watts per linear foot.
  2. Outdoor chilled water, hot water, and domestic cold water makeup piping: 5 watts per linear foot.
  3. Outdoor cooling tower drain piping: 5 watts per linear foot.

- D. Install heat tape underneath, insulation and jackets specified in this section.
- E. Provide ambient air sensing thermostat to switch the heat tape off when ambient conditions rise above setpoint. Provide one thermostat for each circuit.

## **2.4 MATERIALS FOR FITTINGS AND VALVES**

- A. Premolded or mitered and fitted insulation and one-piece PVC insulated fitting covers.
- B. Provide factory pre-molded one-piece PVC insulated fitting covers, precut insulation inserts and installation materials for the following services.
  - 1. All pipe fittings and valves.
  - 2. All grooved coupling installations.
- C. Materials to be equal to Foster Seaglass PVC fitting cover, UNI-Fit inserts and accessories, or equivalent by Molded Acoustical Products, Inc., Hamfab, Zeston division of Mansfield; or Armstrong Products.

## **2.5 COATINGS, FINISHES, AND JACKETS**

- A. Piping and Equipment:
  - 1. Prior to application of all pipe insulation, pipe surfaces shall be cleaned of rust and debris and painted. Prior to starting painting, Engineer and/or CM shall approve pipe when cleaned and painted.
  - 2. All chill water piping and all piping in Mechanical Rooms shall be painted with one coat of rust proof paint after cleaning and prior to application of insulation. Paint on hot water, steam and condensate piping shall be high temperature.
  - 3. For pipe, fittings, and valves through 1-1/2-inch size in systems exposed-to-view inside building or in equipment rooms, finish to be PVC factory jacket.
  - 4. For tanks, heat exchangers, insulated equipment and pipes 2" and larger in systems exposed inside building or in equipment rooms, cover insulation with one layer of 8 oz. canvas and finish with fire retardant logging adhesive ready for painting.
  - 5. Fitting Jackets: Inside use PVC molded one-piece or matching 2-piece jacket:
    - a. Hot surfaces; apply with stainless steel tacks or staples.
    - b. Cold surface; use 2" wide, 10 mil vinyl tape furnished by manufacturer of jacket. Where vapor barrier is required, apply tape to jacket and vapor barrier on pipe before canvas is applied.
  - 6. For any service when above grade and exposed to the weather outside building, cover pipe insulation with 0.016-inch-thick aluminum jacket.
  - 7. Do not insulate valves in systems operating above 60 degrees F. Paint valves with a rust-resistant product equivalent to Rustoleum.
  - 8. For flexible tubular elastomeric pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of fire-retardant self-extinguishing vinyl lacquer type flexible coating equivalent to Armstrong "Armaflex Finish".
- B. Ducts
  - 1. In Equipment Rooms and where exposed to view: 8 oz canvas treated with fire retardant lagging adhesive. Seal joints and seams with 3" aluminum tape. Reinforce corners.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**



- A. All surfaces to be clean and dry (and painted where noted above) when covering is applied. Covering to be dry when installed and during application of any finish.
- B. All adhesives, cements, and mastics to be compatible with materials applied without attacking materials in either wet or dry state.
- C. Insulation Exposed to view to have a well-tailored appearance.
- D. Do not insulate expansion tanks or heads of hot water pumps.
- E. Install all insulation in accordance with manufacturer's instructions.

### **3.2 PENETRATION OF RATED WALLS, PARTITIONS, AND FLOORS**

- A. Do not pass pipe insulation through fire rated partitions or floors unless firestopping system is listed for insulated pipe. Stop and properly terminate insulation at each side of partition.
- B. Install foamglass insulation on chilled water piping where lines pass through rated partitions.
- C. Stop all duct coverings including jacket and insulation at all penetrations of rated walls. Flare-out or extend insulation jacket at least 2-inches beyond angle frames of fire dampers and seal to structure.
- D. Maintain vapor barrier.
- E. Install covering over damper and smoke detector access doors readily removable and identifiable.

### **3.3 INSTALLATION OF DUCT INSULATION**

- A. Install in accordance with TIMA National Insulation Standards.
- B. Insulated ductwork conveying air below ambient temperature:
  - 1. Provide insulation with vapor barrier jacket.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
  - 1. Provide with or without standard vapor barrier jacket.
  - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Blanket type insulation:
  - 1. Apply jacketed blanket type glass fiber pulled snug to ducts but not more than 1/2-inch compression at corners.
  - 2. Use insulation having 2-inch tab or cut insulation long enough to allow for "peel-off" of insulation from jacket to affect a minimum overlap tab of 2-inch.
  - 3. Staple lap with flare type staples on 1-inch centers.
  - 4. Cover standing seams, stiffeners, and braces with an insulation blanket, using 2-inch jacket lap and staple lap.
  - 5. Cover and seal all staples and attachment pins with foster 30-35 reinforced with glass cloth or FSK tape.
  - 6. Apply insulation with approved adhesive and weld pins at 18" o.c. on the bottom of ducts 16" or wider. Provide pins at 18" o.c. on sides of ducts 20" or more. Vertical ducts that are larger than 16" shall have weld pins on all sides. Overlap facing 3" and seal with

approved adhesive or apply reinforced aluminum tape. Seal punctures and breaks with aluminum tape.

E. Jacketed Board Type Insulation:

1. Apply jacketed board type insulation to ducts using adhesive and weld pins or nylon "Stick-clip" plates having self-locking, coated metal or nylon discs.
2. If insulation is grooved for corners, pin as required to hold insulation tight to duct.
3. Seal pins and joints with Foster 30-56 reinforced with glass cloth or FSK tape.
4. Insulation shall be applied to the ductwork using approved adhesive and mechanical fasteners such as weld pins or stick clips located not less than 3" from each edge or corner of the board. Pin spacing along the duct not greater than 12" o.c. Additional fasteners used on the sides and bottom of all ducts at a maximum spacing of approximately 18" o.c. All edges and joints sealed with 5" wide aluminum vapor barrier tape applied with Foster 85-20 adhesive. All punctures in the vapor barrier facing likewise sealed.
5. Cover all joints, rips, tears, punctures, disc heads, staples, or breaks in vapor barrier jacket with 4-inch-wide woven glass fabric tape embedded in equivalent of Childers CP-82 or Benjamin-Foster No. 85-20 "Sparkfast" vapor barrier fire resistant adhesive. Pressure sensitive tape permitted if recommended by manufacturer.
6. Cover all board type insulation with 8 oz. canvas jacket applied with fire retardant logging adhesive.

F. Rigid Foam Insulation:

1. Apply with adhesive as recommended and weld pins or "Stock-clips" having self-locking metal or nylon discs.
2. Place pins 3" from edges and not more than 18" O.C.
3. Seal all joints and pin penetrations with 3" wide aluminum tape or as recommended by the manufacturer.
4. Finish insulation with 2 coats of Armaflex white paint.

### 3.4 INSTALLATION OF PIPE INSULATION

- A. Install in accordance with TIMA National Insulation Standards.
- B. Exposed Piping: Cover insulation with 8 oz canvas or factory jacket as noted above. Locate seams in least visible locations. Size canvas for painting. Paint (color as noted herein or as required by owner) canvas and PVC fitting covers.
- C. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
  1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe and PVC fitting covers.
- E. Glass fiber insulated pipes conveying fluids above ambient temperature:
  1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. Insulation above furred ceiling and in chases requires no finish beyond factory jacket.
- G. Inserts and Shields:
  1. Shields: Galvanized steel between pipe hangers or hanger rolls and insulation.
  2. Insert location: Between support shield and piping and under the finish jacket.
  3. Insert configuration: Minimum 12" inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  4. Insert material: Hydrous calcium silicate or foamglas insulation material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire and smoke separations, refer to Section 23 0500.

### **3.5 INSTALLATION OF EQUIPMENT COVERING**

- A. Factory Insulated Equipment: Do not insulate, except as otherwise noted.
- B. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands as appropriate.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- D. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- E. Fiber glass insulated equipment containing fluids below ambient temperature: Provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.
- F. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.
- G. Fiber glass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.
- H. Finish insulation at supports, protrusions, and interruptions.
- I. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.
- J. Exterior Applications: Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.
- K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed for inspection.

### **3.6 INSTALLATION OF ONE-PIECE PVC INSULATED FITTING COVERES**

- A. Premolded fitting covers to be precisely cut or mitered to fit or be tucked snugly into the throat of fitting and edges adjacent to pipe covering and taped to form a fully insulated pipe covering.
- B. Use adhesive and/or tape specified for type of insulation to insure a thorough vapor barrier.
- C. Tape ends securely to adjacent pipe covering. Tape to extend over adjacent pipe insulation with an overlap of at least 2-inch on both sides.

**END OF SECTION 23 0700**

**SECTION 23 2113**  
**HYDRONIC PIPING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES:**

- A. Pipe and pipe fittings for:
  - 1. Heating water piping system.
  - 2. Chilled water piping system.
  - 3. Condenser water piping system.
  - 4. Equipment drains and overflows.
- B. Valves:
  - 1. Gate valves.
  - 2. Globe or angle valves.
  - 3. Ball valves.
  - 4. Butterfly valves.
  - 5. Check valves.

**1.2 GENERAL REQUIREMENTS**

- A. Where more than one piping system material is utilized, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded connections to valve bodies, equipment or other apparatus.
- D. Except where shown otherwise, use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use ball or butterfly valves for throttling, bypass, or manual flow control requirements for water systems if special valves or fittings are not indicated.
- F. Use spring loaded check valves on discharge of pumps when piped in parallel.
- G. Use lug type butterfly valves to isolate equipment.
- H. Use 3/4-inch ball valve with cap for drains at low points of piping, bases of vertical risers, and at equipment.
- I. All piping and fittings to be made in USA.

**1.3 REFERENCES**

- A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B31.9 - Building Services Piping.
- D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc coated Welded and Seamless.
- E. ASTM A234 - Piping Fitting of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

- F. ASTM B32 - Solder Metal.
- G. ASTM B88 - Seamless Copper Water Tube.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers. Protect machined surfaces.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

#### **1.6 SUBMITTAL**

- A. Restrained joint calculations; submit complete calculations for all underground ductile iron pipe joints indicating the requirements for restrained and push-type joints. Unless submitted, all joints shall be restrained type. Submission of output data from an approved vendor computer selection/calculation program will be required to justify the use of push-type joints in certain locations. This program shall utilize the depth of cover of a minimum of 3 feet, the specified test pressure for the system, a 1.5 safety factor and ANSI/AWWA C150/A21.50 Type 4 laying condition.

### **PART 2 - PRODUCTS**

#### **2.1 REQUIREMENTS:**

- A. All piping material shall be manufactured in the USA.

#### **2.2 HEATING WATER, CHILLED WATER, ABOVE GROUND**

- A. Steel Pipe: ASTM A53, Schedule 40, (0.375-inch (10 mm) wall for sizes 2-1/2 inch (300 mm) and over,) black.
  - 1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding typed fittings.
  - 2. Joints: Threaded or welded.
- B. Copper Tubing: ASTM B88, Type L hard drawn for pipe sizes 2" and smaller.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder, wrought copper.
  - 2. Joints: Solder, lead free 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

#### **2.3 CONDENSER WATER PIPING, ABOVE GROUND INSIDE OR OUTSIDE BUILDING**

- A. Steel Pipe: ASTM A53, Schedule 40, black.
  - 1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding typed fittings.
  - 2. Joints: Threaded or welded.

#### **2.4 CONDENSER WATER PIPING, BURIED**

- A. Ductile Iron Pipe: The pipe and fittings shall be suitable for a minimum working pressure of 150 psi, ANSI C151/A21.51, with asphalt coating and cement mortar lining ANSI/AWWA C104/A21.4.
- B. Fittings shall be ductile iron mechanical joint type manufactured in accordance with ANSI/AWWA C110/A21-10, rated for 150 psi working pressure. Straight pipe joints and fittings to be a combination of push-type and restrained joint-type. Joints and fittings shall be flexible and shall be designed to provide positive restraint against end-wise separation due to thrust.
- C. Push type joints shall be equal to American Fastite joint or U.S. Pipe Tyton joint, ANSI/AWWA C111/A21.11, tapered bell opening, 5 degrees lateral offset capability. Gasket material shall be

SBR with two hardness: 85 durometer hardness for smaller end of gasket and 65 durometer hardness for larger end of gasket.

- D. Restrained type joint fittings shall be equal to EBBA Iron Series 1100 Megalug restraint systems for mechanical joint ductile iron piping, fittings, and valves. Gasket material shall be SBR.

## **2.5 EQUIPMENT DRAINS AND OVERFLOWS**

- A. Drains:

1. Copper tubing, ASTM B-88, Type L hard drawn.
  - a. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
  - b. Joints: Solder, lead free 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

## **2.6 UNIONS, FLANGES, AND COUPLING**

- A. Union for Pipe 2 inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

- B. Flanges for Pipe Over 2 inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16-inch-thick preformed neoprene.

## **2.7 VALVES**

- A. Furnish and install all valves as called for, shown on drawings or as required for proper operation and servicing of the equipment. Valves shall be of manufacturer as noted or equivalent.

- B. Butterfly valves; "bubble tight" at 150 psi and 200 degrees. Construction shall be:

1. Body - Ductile Iron.
2. Seat - E.P.D.M.
3. Disc - Ductile iron or aluminum-bronze.
4. Stem - 304, 316 or 17-4PH S.S.
5. Hammond 6000 Series, Victaulic, Nibco LD-1000 or equivalent.
6. Provide 9" lever handle with infinitely adjustable throttling plate with lock nut and memory stop. Valves in insulated piping shall have 2" extended neck. VALVES 8" and larger; screw or gear operator. All butterfly valves shall be "lug" type for bolting to a standard flange.

- C. Ball Valves - 600# W.O.G., 3-piece, full port:

1. Body - Bronze.
2. Seat - Teflon.
3. Ball - 304 or 316 stainless steel.
4. Stem - 304 or 316 stainless steel.
5. O-Ring - Viton or Teflon.
6. Hammond 8303, Victaulic, Nibco 595-Y-66 or equivalent.
7. Valves in insulated piping; 2" extended neck.

- D. Globe valves 0-2" - 300# Bronze, Rising Stem:

1. Body – Bronze.
  2. Stem - Silicon Bronze.
  3. Disc – Bronze.
  4. Handwheel - Malleable iron.
  5. Packing - Teflon impregnated, asbestos-free.
  6. Hammond IB412, Nibco T-275 or equivalent.
- E. Globe valves over 2" - 125# O.S.&Y, Rising Stem:
1. Body – Iron.
  2. Stem - Brass or Bronze.
  3. Disc – Bronze.
  4. Seat Ring – Bronze.
  5. Yoke Bushing – Bronze.
  6. Packing - Teflon impregnated, asbestos-free.
  7. Hammond IR116, Nibco F-718-B or equivalent.
- F. Swing Check Valves 0 - 2" - 150# bronze:
1. Body – Bronze.
  2. Disc – Bronze.
  3. Hammond IB 904, Nibco T-433 or Victaulic equivalent.
- G. Swing Check Valves 2" and over - 125# iron:
1. Body – Iron.
  2. Disc – Bronze.
  3. Seat ring – Bronze.
  4. Hammond IR1124, Nibco F-918 or Victaulic equivalent.
- H. Non-slam check valves:
1. Body – Iron.
  2. Disc – Bronze.
  3. Seat – Bronze.
  4. Spring - Stainless Steel.
  5. Mueller No. 105, Williams-Hagen, Victaulic or equivalent.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Make piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 2500.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.



- B. All chilled, hot, and condenser water piping shall be hydrostatically tested for pressure of 1-1/2 times the working pressure of the line, but not less than 150 psig for a minimum period of 24 hours. This hydrostatic test shall be witnessed by the Engineer.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space, and not interfere with use of space and other trades.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through masonry partitions, walls, and floors.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 3. Where inserts are omitted, drill concrete slab from below and provide expansion anchor or use an appropriate powder driven stud where permitted.
- J. Pipe Hangers and Supports:
  - 1. Install in accordance with ASTM B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
  - 4. Place hangers within 30 inches of each horizontal elbow or tee.
  - 5. Use hangers with 1-1/2-inch minimum vertical adjustment. Arrange hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed insulated parallel and at same elevation, provide trapeze hangers.
  - 8. Prime coat exposed steel hangers and supports and prepare for finish painting. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- L. Provide access where valves and fittings are not exposed.
- M. Slope piping and arrange system to drain at low points. Use eccentric reducers to maintain proper grade.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Pipe Joints: Unless otherwise specified, join pipes as follows:
  - 1. Steel pipe 2-1/2" to 4", screwed or welded joints.
  - 2. Steel pipe 4" and larger, welded, or flanged joints.

- 3. For welded joints, use only welding type fittings and welding neck flanges with the following exception:
  - a. "Weldolet" or "Threadolet" type of welding fittings for intersection welding of small branches to mains may be used where branch is two-pipe sizes smaller than the main.
- Q. Do not make direct welded connections to valves, expansion joints, strainers, apparatus, or any other units which are intended to be removable.
- R. Copper tube, Type "K" and "L" shall have soldered joints with sweat joint type bronze or copper fittings up through 1-1/2" size. Fitting sizes 2" and larger shall be brazed joints. Flared joints with flare type bronze fittings may be used where approved for specific service.
- S. For screwed joints, use Teflon tape or approved pipe joint compound; apply only on male threads.
- T. For buried condenser water piping provide buried utility warning and identification tape. Polyethylene plastic tape manufactured specifically for warning and identifying buried utility lines shall be supplied and installed. Tape shall be buried above the pipe during the trench backfilling operation and shall be buried approximately 12" below grade. Tape shall be (0.004-inch-thick polyethylene) (polyethylene with a metallic core). Tape shall be 6" wide and printed with a caution and identification of the piping system over the entire tape length. Tape shall be yellow with bold black letters. Tape color and lettering shall be unaffected by moisture and other substances contained in the backfill materials.

**3.3 SCHEDULES**

A. Pipe Hanger Spacing:

<b>Pipe Size Inches</b>	<b>Max Hanger Spacing Feet</b>	<b>Diameter Inches</b>
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	12	7/8
14 and Over	12	1
Non-metallic (All Sizes)	6	3/8

**END OF SECTION 23 2113**

**SECTION 23 2116**  
**HYDRONIC SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES:**

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Glycol Make-up Unit (GMU).
- E. Strainers.
- F. Pump suction fittings.
- G. Flow indicators, controls, meters.
- H. Pressure Reducing valves.
- I. Relief valves.
- J. Flexible coupling.

**1.2 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years' experience.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**PART 2 - PRODUCTS**

**2.1 EXPANSION TANKS**

- A. Construction: System Connection – Forged Steel, Shell – Carbon Steel, Bladder – Heavy Duty Butyl Rubber, Designed and constructed per ASME section VIII, Division I. The tank shall be fitted with lifting rings and a floor mounted skirt for vertical installation.
- B. Provide pre-charged steel expansion tank with replaceable heavy duty Butyl rubber bladder/diaphragm.
- C. Provide charging valve to facilitate on-site charging of the tank to meet system requirements. Charge bladder tanks to minimum fill pressure as shown on plans.

**2.2 AIR VENTS**

- A. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with one-piece, 1/4" ball valve at top of chamber.

**2.3 AIR SEPARATORS**

- A. Combination Air Separators/Strainers:
  - 1. Steel, tested and stamped in accordance with ASME SEC 8-D for 1125 psig operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

## 2.4 GLYCOL MAKE-UP UNIT (GMU)

- A. Glycol Make-up Unit (GMU):
1. Provide as shown on the plans and as described in these specifications: provide a packaged, automatic 25% propylene glycol solution make-up unit model GMU-30 as manufactured by ITT Bell & Gossett or approved equal by Taco or Armstrong. The package shall consist of a base, 55-gallon polyethylene reservoir with removable lid, visible solution level scale in gallons and liters, y-strainer, isolation valve, pump, open drip-proof motor, pump isolation, check and balance valve, expansion tank, discharge pressure gage, motor contactor and control circuit in a NEMA 4 panel, and necessary interconnecting piping.
  2. Green light shall indicate power supplied to unit. Pump shall start based on falling pressure. System shall require a 115/1/60 single power connection and a 3/4" NPT system piping connection. GMU shall provide 10 GPM and maintain a fill pressure of 30 PSI. Unit includes low level cutout, with red indicator light and 110V contact for alarm indication, to stop the pump during low level condition. Mechanical contractor shall provide application specific pressure reducing valve between GMU and connection to the system piping.

## 2.5 STRAINERS

- A. Size 2 inch and Under:
1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32-inch stainless steel perforated screen.
- B. Size 2-1/2 inch to 4 inch:
1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 in stainless steel perforated screen.

## 2.6 PUMP SUCTION FITTINGS

- A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16-inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
- B. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping inside.

## 2.7 AUTOMATIC FLOW CONTROLS

- A. Automatic Flow Control Valves: Automatic flow control valve cartridges shall automatically control flow rates with +/- 5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. Valve internal control mechanism shall consist of a stainless-steel one-piece cartridge with segmented port design and full travel linear coil spring. Manufacturer shall be able to provide certified independent laboratory tests verifying accuracy of performance. All flow control valve cartridges shall be warranted by the manufacturer for five years. Meter kit shall be provided as a single hose portable or double hose portable kit; pressure gauge with 4.5" dial shall have a range of -14.7 to 150 psig. Kit shall have end connections for either pressure or pressure/temperature test valves and shall include carrying cases. All kits shall include flow rate chart for determining flow rate.

## 2.8 COMBINATION BALANCING FITTING (WITH FLOW READ OUT)

- A. Manufacturers:
1. Bell & Gossett.
  2. Taco.
  3. Armstrong.
- B. Construction: Bronze body/brass ball construction with glass and carbon filled TFE seat rings.

- C. Functions: 1/4" Pressure/temperature readout ports.
  - 1. Flow measurement.
  - 2. Flow balancing.
  - 3. Positive shut-off.
  - 4. Drain port.
- D. Control Mechanism: Calibrated ball valve with hand wheel indicating balance positions and memory stop.
- E. Working Pressure: 200 PSI.

## **2.9 PRESSURE REDUCING VALVE**

- A. Iron body, low inlet pressure check valve, removable strainer. 125 psi working pressure.

## **2.10 RELIEF VALVES**

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

## **2.11 FLEXIBLE COUPLINGS & VIBRATION ISOLATION**

- A. Rotating and reciprocating equipment provided with suitable vibration isolating system. Isolation for all equipment above the ground floor designed for at least 95% absorption efficiency. Select isolators for proper loading to obtain desired efficiency.
- B. Provide flexible duct connections at inlet and outlet of all fans or cabinets containing fans.
- C. Piping connections to pieces of equipment containing rotating or reciprocating machinery (except inline pumps) provided with isolators to prevent transmission of vibration or noise to building structure. Water lines shall be provided with flexible Teflon coupling designed for service and operating pressure. Flexible metal hose shall be of approved design. Where such flexible connections do no accomplish full desired result, piping shall be suspended by means of properly loaded and distributed vibration eliminators design for support rods.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. Provide air separator on suction side of system pumps and connect to expansion tank.
- E. Provide valved drain and hose connection on strainer blow down connection.
- F. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.
- G. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.
- H. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- I. Select equipment relief valve capacity to exceed rating of connected equipment.
- J. Pipe relief valve outlet to nearest floor drain.

**END OF SECTION 23 2116**

**SECTION 23 3100**  
**DUCTWORK**

**PART 1 - GENERAL**

**1.1 PERFORMANCE REQUIREMENTS**

- A. Variation of duct configuration or sizes permitted for job conditions. Size ducts installed in accordance with ASHRAE table of equivalent rectangular and round ducts.

**1.2 REFERENCES**

- A. NFPA 90A - Installations of Air Conditioning and Ventilating Systems.
- B. SMACNA – HVAC Air Duct Leakage Test Manual.
- C. SMACNA – HVAC Duct Construction Standards – Metal and Flexible.
- D. SMACNA – Fibrous Glass Duct Construction Standards.
- E. UL 181 – Factory-Made Air Ducts and Connectors.

**1.3 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A, NFPA 96 and SMACNA standards.

**1.4 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install duct sealants or adhesives when temperatures are less than those recommended by manufacturer.
- B. Maintain temperatures during and after installation of duct sealants.

**1.5 SUBMITTALS**

- A. Product Data:
  - 1. Provide the following information for each sealant system furnished on the Project:
    - a. Sealant name and type.
    - b. Sealant system design pressure.
    - c. Duct material.
    - d. Duct gage.
    - e. Transverse joint methods.
    - f. Longitudinal seam type.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Galvanized Steel Ducts: ASTM A623 and ASTM A623M galvanized steel sheet, lock-forming quality, having G60 zinc coating in conformance with ASTM A90.
- B. Stainless Steel: ASTM A480, Type 304, sheet form, with No. 1 finish.
- C. Uninsulated Flexible Ducts (Exhaust or Return):
  - 1. Manufacturers: Flexmaster Type NI35.
  - 2. UL-181, Class I: corrosion resistant galvanized steel helix permanently bonded to an impregnated, coated woven fiberglass cover.
  - 3. Pressure rating: 10" positive, 4" negative.
  - 4. Maximum velocity: 5000 fpm.
  - 5. Operating temperature: 0° to 200°F.

D. Insulated Low Pressure Flexible Ducts:

1. Manufacturer: Flexmaster Type 8M.
2. UL-181, Class I: coated, woven glass fiber mesh liner bonded permanently to corrosion resistant, galvanized steel helix, thick glass fiber insulation and low-perm vapor barriers of glass fiber reinforced metalized laminate with 3 plg standing seam and brass grommets.
3. Pressure rating: 4" positive, 2" negative.
4. Maximum Velocity: 3500 fpm.
5. Operating Temperature: 0° to 180°F.
6. Thermal Conductance: .23 @ 75°F.

E. Insulated Medium Pressure Flexible Ducts:

1. Manufacturer: Flexmaster Type 4M.
2. UL-181, Class I: a heavy coated fiberglass cloth locked permanently to a galvanized steel helix, glass fiber insulation with fiberglass scrim on the outside; polyolefin vapor barrier jacket.
3. Pressure rating: 10" positive.
4. Maximum Velocity: 5000 fpm.
5. Operating Temperature: -20° to 200°F.
6. Thermal Conductance: .23 @ 75°F.

F. Fasteners: Rivets, bolts, or sheet metal screws; stainless steel for stainless steel ductwork.

G. Sealants:

1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
2. Sealant shall be water based latex UL 181A-M, B-M reinforced sealant conforming to the product specifications.
3. Sealant shall be water based latex UL 181 B-M non-reinforced sealant conforming to the product specifications.
4. All ductwork in a UL classified rolled mastic duct sealant rated tape system shall be comprised of:
  - a. Rolled Mastic Sealant 2 mil foil faced with 15 mils of butyl adhesive/sealant conforming to the product specifications for UL classified sealants.
  - b. Rolled Mastic Sealant 2 mil foil faced with 15 mils of modified butyl mastic/sealant meeting UL-181 BFX (pressure sensitive tapes for use with flexible air ducts) for UL listed sealants.

H. Hanger Rod: ASTM A36; steel, threaded both ends, threaded one end, or continuously threaded.

**2.2 SPECIAL EXHAUST DUCTS**

- A. The laboratory exhaust systems shall be fabricated from 18 gage stainless steel with all joints and seams welded.
- B. Ductwork shall be watertight and shall slope continuously back to the hood.

**2.3 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for

operating pressures indicated. Unless noted otherwise, pressure class shall be determined by fan rating.

- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two (2) gages heavier than duct gages indicated in SMACNA Standard. Prime coat welded joints with zinc-rich paint.
- E. Provide standard 45-degree lateral wye takeoffs or 90-degree conical tee connections.
- F. Uninsulated panels of ducts over 12 inches wide shall be cross broken, except plenum casings, which shall be braced with angle iron as called for.
- G. All ductwork must present a smooth interior and joints must be air tight.
- H. Manual volume and splitter dampers to be furnished and installed where shown and where necessary for proper regulation of the air distribution. A quadrant and set screw equal to "Ventlock" #641 shall be installed for all dampers which are accessible.
- I. When the system is in operation, the ductwork shall be free from rattles and air noises caused by unsecure duct construction.
- J. All ductwork, low pressure supply, medium pressure supply, return, exhaust, and outside air ductwork shall be constructed to meet SMACNA seal class A.
- K. Refer to section 3.3 for ductwork pressure class schedule.

#### **2.4 MANUFACTURED DUCTWORK AND FITTINGS**

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated in paragraph 3.3.
- B. Round or oval ducts upstream of terminal units shall be prefabricated spiral lock seam conduit with fabricated fittings. All ells shall be 5-piece type. Take-offs shall be formed conical "T", or 45 degree "Y".
- C. Double wall insulated round ducts downstream of terminal boxes: Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 1" thick fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
- D. Round Ducts:
  - 1. Manufacturers:
    - a. United Sheet Metal.
    - b. Semco.
    - c. Hamlin Sheet Metal.
  - 2. Machine made from round spiral lockseam duct with reinforcing corrugations; fittings manufactured of at least two (2) gages heavier metal than duct.
- E. Transverse Duct Connection System:
  - 1. Manufacturers:
    - a. Duct Mate.



2. SMACNA "E" rated rigid connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

F. Double Wall Insulated Duct:

1. Insulation (1" thick; refer to Duct Liner Insulation in Section 23 0700) with solid 20ga. outer liner and 22 ga. inner perforated liner tack welded to support channels. All steel surfaces, channels, and trim to be galvanized steel (G-60).
2. Inner liners shall be perforated with 3/32" holes.
3. Each panel shall be completely filled with noncombustible, mildew resistant insulation with flame spread no greater than 25 and smoke development no greater than 50. Thermal conductance no greater than 0.06 at a mean temperature of 75 deg. F.
4. Provide all structural components, beams, and columns, necessary to support second level of equipment.
5. Joint construction shall be tongue and groove.

## 2.5 ACCESS DOORS

- A. All access doors shall close with air pressure. Small doors for access to dampers, etc., shall be 16" x 16" minimum. They need not be hinged but shall be held in place with sash type locks. They shall have a flanged frame that overlaps liner or insulation.
- B. Ultra-low leakage doors. Nailor Model 0800 Type M1 Double Flange Frame for rectangular duct and Model 0895 for round duct, or equivalent. Knock-over tab frames are not permitted. Maximum leakage must not exceed British Standard DW144 Class A, B, and C.
- C. Provide a safety chain for doors accessed by ladder. Provide grab handles for doors 18" x 10" and larger when there is a positive pressure greater than 3 i.w.c.
- D. Provide long-life closed-cell gaskets.
- E. Provide access door at all locations requiring service access.

## 2.6 DUCT LINER

- A. "Nosing" sheet metal strip shall be installed on leading edge of all internal duct liner.
- B. See section 23 0700 Insulation for liner specification.

## 2.7 DOUBLE WALL PLENUM

- A. Plenum walls and roof shall be constructed of 20 ga. (G60) galvanized interior and exterior skins with 2" 1.5# cu. Ft. density foam insulation set on 4" wide, 4" high concrete curb (2000 psi).
- B. All reinforcing members to be galvanized sized and spaced for 2" negative pressure with T-304 stainless steel fasteners. Maximum deflection shall not exceed 1/200 of any span.
- C. Access door (24"x72") shall be same construction as wall and close with pressure. Access door shall have double gasketed seals around entire perimeter.
- D. Provide two light fixtures (100W ea) with light switch at exterior of access door.
- E. Fastening method to air handler as approved by air handler manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION DUCTWORK

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. It is essential that all air ductwork be practically air tight. Before being insulated or concealed, all medium pressure air ducts and lab exhaust ducts, including the terminal

connections, shall be tested for leakage. Each duct, under an air pressure test shall have no noticeable leaks. The total amount of leakage in the medium pressure supply ductwork of any system shall not exceed 1% of the total cfm of that system as measured by a manometer and a calibrated orifice. Test pressure for medium pressure systems shall be 8" WG and 6" WG for lab exhaust system.

- C. Duct sealant installation shall be in accordance with manufacturer's published recommendations. Allow duct sealant system to cure minimum 48 hours before pressure testing for the fluid applied mastics. Rolled mastic sealants can be tested immediately. All low, medium, and high-pressure duct systems (positive or negative) shall be pressure tested according to SMACNA test procedures (HVAC Air Duct Leakage Test Manual). Notify Owner minimum seven (7) calendar days in advance of leakage testing.
- D. Duct sizes on plans are inside clear dimensions.
- E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect terminal units to supply ducts with maximum length of flexible duct as detailed on plans. Do not use flexible duct to change direction unless shown on drawings.
- I. Connect diffusers to low pressure ducts with maximum length of flexible duct as detailed on plans. Duct to be held in place with strap or clamp.
- J. Connect flexible ducts to metal ducts with adhesive and draw bands. Use sheet metal screws for positive pressure over 2".
- K. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust or weather from entering ductwork system.
- M. Manufactured casings shall be assembled and installed as noted in paragraph 3.1 A above.

### **3.2 CLEANING**

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean duct in sections of size approved by the Designer. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- B. Clean new plenums and accessible ducts in Mechanical/Equipment Rooms with high power vacuum machines. Clean existing plenums and accessible ducts in Mechanical/Equipment Rooms where indicated with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

### **3.3 DUCTWORK PRESSURE CLASS SCHEDULE**

<b>Air System</b>	<b>Pressure Class Inch</b>
Low Pressure Supply (HVAC Systems and downstream of terminal units)	2
Medium Pressure Supply (upstream of terminal units)	6
Space Exhaust	4
Fume Hood Exhaust	4

**END OF SECTION 23 3100**

**SECTION 23 3300  
DUCTWORK ACCESSORIES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Duct Silencers (Sound Attenuators).
- B. Air turning devices/extractors.
- C. Backdraft dampers.
- D. Duct test holes.
- E. Flexible duct connections.
- F. Volume control dampers.
- G. Fire Dampers
- H. Combination Fire and Smoke Dampers

**1.2 REFERENCES**

- A. NFPA 90A - Installation of Air conditioning and Ventilating Systems.
- B. NFPA 92A - Smoke Control Systems.
- C. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service.
- E. UL 555 - Fire Dampers and Ceiling Dampers.
- F. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 - PRODUCTS**

**2.1 DUCT SILENCERS (SOUND ATTENUATORS)**

- A. Manufacturers:
  - 1. Vibro-Acoustics.
  - 2. Price.
  - 3. IAC.
- B. Description: low frequency rectangular duct silencer fabricated in accordance with SMACNA HVAC Duct Construction Standards Metal.
- C. Materials:
  - 1. Outer Casing: Minimum 22 gage (0.8 mm) thick galvanized steel stiffened as required, with welded seams.
  - 2. Inner Casing and Splitters: Minimum 26 gage (0.5 mm) thick perforated galvanized steel.
  - 3. Fill: Fiberglass.

**2.2 AIR TURNING DEVICES/EXTRACTORS**

- A. Multi-Blade device with radius blades attached to pivoting frame and bracket, steel, or aluminum construction, with push-pull operator strap. Provide air turning vanes in all supply and return square elbows. Vanes in medium pressure supply duct shall be double wall type.
- B. Steel or fiberglass fixed vanes for 90 deg. Elbows.

### **2.3 BACKDRAFT DAMPERS**

- A. Manufactures:
  - 1. Ruskin Manufacturing Co.
  - 2. Arrow.
  - 3. United Emertech.
  - 4. Kinetics Noise Control.
- B. Gravity backdraft dampers furnished with air moving equipment may be air moving equipment manufacturer's standard construction.
- C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: galvanized steel, extruded aluminum, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90-degree stop, and plated steel pivot pin adjustment device to permit setting for varying differential static pressure.

### **2.4 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

### **2.5 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA Medium Pressure Duct Construction Standards, and as indicated.
- B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 2 inches wide, crimped into metal edging strip.

### **2.6 VOLUME CONTROL DAMPERS**

- A. Manufactures:
  - 1. Ruskin Manufacturing Co.
  - 2. Arrow.
  - 3. United Emertech.
- B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- C. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and tow gages heavier for sizes over 24 inches.
- D. Fabricate splitter of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- E. Fabricate single blade dampers for duct sizes to 12 x 48 inch.
- F. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 122 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- G. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- H. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
- I. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

## **2.7 FIRE DAMPERS**

- A. Manufactures: Ruskin, Prefco, Arrow, Nailor
- B. Fabricate in accordance with NFPA 90A and UL 555, and as required by current building code
- C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.
- D. Fusible Links: UL 33, 165 degrees F.

## **2.8 COMBINATION FIRE AND SMOKE DAMPERS**

- A. Manufactures: Ruskin, Nailor, Safe-Air
- B. Fabricate in accordance with NFPA 90A, UL 555 and UL 555S.
- C. Fire Resistance: 1-1/2 hours.
- D. Leakage Rating: Class I, maximum of 8 cfm at 4 in wg differential pressure
- E. Damper Temperature Rating: 250°F
- F. Frame: 16 gage, galvanized steel.
- G. Blades:
  - 1. Style: Airfoil-shaped, single piece, double skin.
  - 2. Action: Opposed.
  - 3. Orientation: Horizontal.
  - 4. Material: Minimum 16 gage equivalent thickness, galvanized steel.
  - 5. Width: Maximum 6in.
- H. Bearings: Stainless steel pressed into frame.
- I. Seals: Silicone blade edge seals and flexible stainless steel jamb seals.
- J. Linkage: Concealed in frame.
- K. Release Device: Close in controlled manner and lock damper through actuator closure spring.
- L. Actuator:
  - 1. Type: Electric 120V, 60Hz, two-position, fail close
  - 2. Mounting: External.
- M. Electric Fusible Link with Test Switch
  - 1. Release Temperature 165°F
- N. Finish: Mill galvanized.
- O. Factory installed sleeve. Furnish silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Verify that electric power is available and of the correct characteristics.

### **3.2 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

- C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- D. Provide duct test holes where indicated and required for testing and balancing purposes. Neoprene plugs.
- E. Install automatic dampers in manner directed by Temperature Control Sub-Contractor.
- F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION 23 3300**

**SECTION 23 3600**  
**TERMINAL UNITS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Variable volume supply reheat terminal units.
- B. Integral heating coils.
- C. Integral damper motor operators.
- D. Integral controls.
- E. Laboratory terminal units and Lab Control.

**1.2 PERFORMANCE TOLERANCES**

- A. Base performance on tests conducted in accordance with ADC 1062.

**1.3 OPERATION AND MAINTENANCE DATA**

- A. 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.

**1.4 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

**1.5 REGULATORY REQUIREMENTS**

- A. Products Requiring Electrical Connection: Listed and classified testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Terminal units for spaces other than laboratory spaces:
  - 1. Price.
  - 2. Metal-Aire.
  - 3. Nailor Industries.
  - 4. Tuttle & Bailey.
  - 5. Titus.
  - 6. Environmental Technologies, Inc./Johnson Controls, Inc (ETI/JCI).
- B. Supply, Return and Exhaust Terminal Units (Valves) for Laboratory:
  - 1. Accutrol
  - 2. Price
  - 3. Siemens

**2.2 MANUFACTURED UNITS**

- A. Variable air volume supply air control terminals for connection to single duct, central air systems, with electronic variable volume controls and hot water heating coils.
- B. Variable air volume exhaust air control terminals for connection to single duct, central air systems, with electronic variable volume controls and electric heating coil.



- C. Identify each terminal unit with clearly marked identification label and airflow indicator. Include unit nominal air flow, maximum factory set airflow, minimum factory set air flow, and coil type.

### **2.3 SINGLE DUCT VARIABLE VOLUME SUPPLY UNITS**

- A. Basic Assembly:
  - 1. Casings: Minimum 22 gage galvanized steel.
  - 2. Lining: Minimum ½ inch thick foil-faced fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements.
  - 3. Plenum Air Inlets: Round stub connections for duct attachment.
  - 4. Plenum Air Outlets: S slip and drive connections.
  - 5. Heating Coils: Factory mounted and insulated.
- B. Basic Unit:
  - 1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
  - 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 3 inches rated inlet static pressure.
  - 3. Mount damper operator to position damper normally closed.
- C. Hot Water Heating Coil:
  - 1. Construction: 1/2-inch (13 mm) copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig (10380 kPa) pressure, factory installed.
- D. Automatic Damper Operator:
  - 1. Electric Actuator: 24-volt with high limit Velocity Reset Controller and Probe:
    - a. Electronic.
    - b. Minimum and maximum limits set at reset device.
    - c. Maintain air flow to within 5 percent of set point with inlet static pressure variations up to 2 inches.
    - d. Reset span, adjustable 3 to 8 psi (21-55 kPa) shall remain constant regardless of minimum or maximum setting. Reset start point shall be adjustable from 3-10 psi (21-69 kPa).
    - e. Provide terminal units with insulated access panel.

### **2.4 LABORATORY VARIABLE VOLUME UNITS (SUPPLY, RETURN, EXHAUST)**

- A. General:
  - 1. This system shall be provided, installed, and warranted by the Building EMS provider under Section 23 0923.
  - 2. A laboratory airflow control system shall control the airflow into and out of laboratory rooms. The exhaust flow rate of a laboratory fume hood shall be controlled precisely to maintain a constant average face velocity into the fume hood at either a standard/in-use or standby level based on an operator's presence in front of the fume hood. The laboratory control system shall vary the amount of make-up/supply air into the room to operate the laboratories at the lowest possible airflow rates necessary to maintain temperature control, achieve minimum ventilation rates and maintain laboratory pressurization in relation to adjacent spaces (positive or negative). The laboratory airflow control system shall be capable of operating as a standalone system or as a system integrated with the Building Management System (BMCS).

B. Basic Unit:

1. The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2000.
2. The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.
3. The airflow control device shall maintain accuracy within  $\pm 5\%$  of signal over an airflow turndown range of no less than 16 to 1.
4. No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.
5. The airflow control device shall be constructed of one of the following three types:
  - a. Class A—The airflow control device for non-corrosive airstreams, such as supply and general exhaust, shall be constructed of 16-gauge aluminum. The device's shaft and shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of aluminum. The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a Teflon, polyester, or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24-gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.
  - b. Class B—The airflow control device for corrosive airstreams, such as fume hoods and biosafety cabinets, shall have a baked-on, corrosion-resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of 316 or 303 stainless steel. The pressure independent springs shall be a spring-grade stainless steel. The internal nuts, bolts and rivets shall be stainless steel. All shaft bearing surfaces shall be made of a Teflon or PPS (polyphenylene sulfide) composite.
6. Actuation: All valve actuation shall be electric, and a UL 916 listed electronic actuator shall be factory mounted to the valve. Loss of main power shall cause the valve to position itself in an appropriate failsafe state. Options for these failsafe states include normally open-maximum position, normally closed-minimum position and last position. This position shall be maintained constantly without external influence, regardless of external conditions on the valve (within product specifications).
7. There shall be no reliance on external or building-level control devices to perform room-level control functions. Each laboratory control system shall have the capability of performing fume hood control, pressurization control, temperature control, humidity control, and implement occupancy and emergency mode control schemes. The laboratory airflow control systems shall have the option of digital integration with the BMCS.
8. Certification:
  - a. Each airflow control device shall be factory calibrated to the job specific airflows as detailed on the plans and specifications using NIST traceable air stations and instrumentation having a combined accuracy of no more than  $\pm 1\%$  of signal over the entire range of measurement. Electronic airflow control devices shall be further

calibrated, and their accuracy verified to  $\pm 5\%$  of signal at a minimum of 48 different airflows across the full operating range of the device.

- b. Each airflow control devices shall be marked with device-specific factory calibration data. At a minimum, it should include the tag number, serial number, model number, eight-point characterization information (for electronic devices), and quality control inspection numbers. All information shall be stored by the manufacturer for use with as-built documentation.
- c. Accuracy shall be no less than  $\pm 0.15\%$  of span (to equal  $\pm 5\%$  of signal with a 15 to one turndown) over the appropriate full-scale range, including the combined effects of nonlinearity, hysteresis, repeatability, drift over a one-year period, and temperature effect. 316L stainless steel materials shall be provided for all exhaust applications. The use of 304 stainless steel materials shall be provided for all make-up air applications.
- d. Airflow sensors shall be of a multi-point averaging type, aluminum construction for all supply and general exhaust applications, 316L stainless steel for all fume hood, canopy, snorkel, and biosafety cabinet applications. Single point sensors are not acceptable.

C. Fume Hood Control:

1. For variable air volume (VAV) systems, a sash sensor shall be provided to measure the height of each vertically moving fume hood sash. A sash sensor shall also be provided for horizontal overlapping sashes.
2. A presence and motion sensor shall be provided to determine an operator's presence in front of a hood by detecting the presence and/or motion of an operator, and to command the laboratory airflow control system from an in-use operating face velocity (e.g., 100 fpm) to a standby face velocity (e.g., 60 fpm) and vice versa.
  - a. The sensor shall define a detection zone that extends approximately 20" (50 cm) from the front of the fume hood. If the sensor does not detect presence and/or motion in its detection zone within five seconds, it shall command the system to the user-adjustable standby face velocity. When the sensor detects the presence and/or motion of an operator within the detection zone, it shall command the system to the in-use face velocity within one second.
  - b. The sensor shall have a control circuit that adapts to its specific surroundings and adjusts automatically for inanimate objects placed within its detection zone. It shall map the area into memory and, after a period of five minutes, nullify the image of the inanimate object and return to a standby mode. When operators enter and leave the zone, the unit shall adjust automatically between in-use and standby modes. If the inanimate object is moved or taken out of the zone, the unit shall re-map the area automatically.
3. The airflow at the fume hood shall vary in a linear manner between two adjustable minimum and maximum flow set points to maintain a constant face velocity throughout this range. A minimum volume flow shall be set to assure flow through the fume hood even with the sash totally closed.

D. Hot Water Heating Coil:

1. Construction: 1/2-inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig (10380 kPa) pressure, factory installed.
2. Minimum 2 row coil shall be provided.
3. Capacity: Based as indicated in schedules.

E. Sound Control:

1. A silencer or sound attenuator shall be provided for each valve (supply, hood exhaust, and general exhaust) . All silencers must be of a packless design (constructed of at least 18-gauge 316L stainless steel when used with fume hood exhaust) with a maximum pressure drop at the device's maximum rated flow rate not to exceed 0.20 inches of water.
  2. All proposed airflow control devices shall include discharge, exhaust and radiated sound power level performance.
- F. Exhaust and Supply Airflow Device Controller:
1. The airflow control device shall be a microprocessor-based design and shall use closed loop control to linearly regulate airflow based on a digital control signal. The device shall generate a digital feedback signal that represents its airflow.
  2. The airflow control device shall store its control algorithms in non-volatile, re-writeable memory. The device shall be able to stand-alone or to be networked with other room-level digital airflow control devices using an industry standard protocol.
  3. Room-level control functions shall be embedded in and carried out by the airflow device controller using distributed control architecture. Critical control functions shall be implemented locally; no room-level controller shall be required.
  4. The airflow control device shall use industry standard 24 Vac power.
  5. The airflow control device shall have provisions to connect a notebook PC commissioning tool and every node on the network shall be accessible from any point in the system.
  6. The airflow control device shall have built-in integral input/output connections that address fume hood control, temperature control, humidity control occupancy control, emergency control, and non-network sensors switches and control devices. At a minimum, the airflow controller shall have:
    - a. Three universal inputs capable of accepting 0 to 10 Vdc, 4 to 20 mA, 0 to 65 K ohms, or Type 2 or Type 3 10 K ohm @ 25-degree C thermistor temperature sensors.
    - b. One digital input capable of accepting a dry contact or logic level signal input.
    - c. Two analog outputs capable of developing either a 0 to 10 Vdc or 4 to 20 mA linear control signal.
    - d. One Form C (SPDT) relay output capable of driving up to 1 A @ 24 Vac/Vdc.
  7. The airflow control device shall meet FCC Part 15 Subpart J Class A and be UL916 listed.
  8. The airflow control device shall maintain a temperature set point by controlling the airflow and the reheat valve (if required) in response to a room temperature sensor. An additional output shall be provided for supplementary cooling or heating of the office space. If the airflow supply device is not required for make-up airflow control for fume hoods, then the one-second speed of response and fail-safe conditions required of the laboratory airflow control system shall not apply.
- G. Control Functions:
1. The airflow control devices shall utilize peer-to-peer, distributed control architecture to perform room-level control functions. Master-slave control schemes shall not be acceptable. Control functions shall include, at a minimum, pressurization, temperature, humidity control, as well as respond to occupancy and emergency control commands.
  2. Pressurization Control:

- a. The laboratory control system shall control supply and auxiliary exhaust airflow devices in order to maintain a volumetric offset (either positive or negative). Offset shall be maintained regardless of any change in flow or static pressure. This offset shall be field adjustable and represents the volume of air, which will enter (or exit) the room from the corridor or adjacent spaces.
  - b. The pressurization control algorithm shall sum the flow values of all supply and exhaust airflow devices and command appropriate controlled devices to new set points to maintain the desired offset. The offset shall be adjustable.
  - c. The pressurization control algorithm shall consider both networked devices, as well as:
    - 1) Up to three non-networked devices providing a linear analog flow signal and any number of constant volume devices where the total of supply devices and the total of exhaust devices may be factored into the pressurization control algorithm.
  - d. Volumetric offset shall be the only acceptable means of controlling room pressurization. Systems that rely on differential pressure as a means of control shall provide documentation to demonstrate that space pressurization can be maintained if fume hood sashes are changed at the same time a door to the space is opened.
  - e. The pressurization control algorithm shall support the ability to regulate the distribution of total supply flow across multiple supply airflow control devices in order to optimize air distribution in the space.
3. Temperature Control:
- a. The laboratory control system shall regulate the space temperature through a combination of volumetric thermal override and control of reheat coils and/or auxiliary temperature control devices. The laboratory control system shall support up to four separate temperature zones for each pressurization zone. Each zone shall have provisions for monitoring up to five temperature inputs and calculating a straight-line average to be used for control purposes. Separate cooling and heating set points shall be writeable from the BMS, with the option of a local offset adjustment.
  - b. Temperature control shall be implemented through the use of independent primary cooling and heating control functions, as well as an auxiliary temperature control function, which may be used for either supplemental cooling or heating. Cooling shall be provided as a function of thermal override of conditioned air with both supply and exhaust airflow devices responding simultaneously so as to maintain the desired offset. Heating shall be provided through modulating control of a properly sized reheat coil.
  - c. The laboratory control system shall also provide the built-in capability for being configured for hot deck/cold deck temperature control.
  - d. The auxiliary temperature control function shall offer the option of either heating or cooling mode and to operate as either a standalone temperature control loop or staged to supplement the corresponding primary temperature control loop.
4. Occupancy Control:
- a. The laboratory control system shall have the ability to change the minimum ventilation and/or temperature control set points, based on the occupied state, in order to reduce energy consumption when the space is not occupied. The occupancy state may be set by either the BMS as a scheduled event or through

the use of a local occupancy sensor or switch. The laboratory control system shall support a local occupancy override button that allows a user to override the occupancy mode and set the space to occupied for a predetermined interval. The override interval shall be configurable from one to 1440 minutes. The local occupancy sensor/switch or bypass button shall be given priority over a BMS command.

5. Emergency Mode Control:
  - a. The laboratory control system shall provide a means of overriding temperature and pressurization control in response to a command indicating an emergency condition exists, and airflow control devices are to be driven to a specific flow set point. The system shall support up to four emergency control modes. The emergency control modes may be initiated either by a local contact input or BMS command.
  - b. Once an emergency mode is invoked, pressurization and temperature control are overridden for the period that the mode is active. Emergency modes shall have a priority scheme allowing a more critical mode to override a previously set condition.
6. Local Alarm Control:
  - a. The laboratory control system shall provide the means of summing selective alarm activity at the room-level network and generating a local alarm signal. The local alarm signal may be directed to any available output, as well as to the BMS. The alarm mask may be configured differently for each room-level system.
7. Diversity Alarm:
  - a. The laboratory control system shall have the ability of monitoring the airflow values for the pressurized space and generating an alarm signal in the event the total exhaust flow exceeds a predetermined threshold. The diversity alarm is intended to allow the user to take diversity in the design and generate an alarm condition in the event the diversity threshold is compromised. This function must be available in either an integrated or standalone system.
8. Fume Hood Control: Airflow devices intended to control the face velocity of a fume hood shall have the ability to interface directly with the fume hood monitoring device. The airflow control device shall:
  - a. Accept command inputs to regulate the flow accordingly and make this command value available to the BMS.
  - b. Accept a sash position signal and make this value available to the BMS.
  - c. Control device shall be capable of accepting a Usage Based Control signal to indicate user presence and make this signal available to the BMS in the future.
  - d. Provide a flow feedback signal to the fume hood monitor, which may be used for calculating face velocity or to confirm the airflow device has achieved the proper flow rate and make this value available to the BMS.
  - e. Provide alarm signals to the fume hood monitor in the event the airflow device is unable to achieve the proper flow rate, there is a loss of static pressure indicating improper fan operation, or there is a loss of power to the airflow control device, in order to provide a local alarm indication.
  - f. The fume hood airflow control device shall respond to changes in sash position within one second, in order to provide a constant 100-feet-per-minute face velocity when the fume hood is in use.

9. The laboratory control system shall be segregated into subnets to isolate network communications to ensure room-level control functions and BMS communications are carried out reliably. Each laboratory space or pressurization zone shall be its own subnet. Commercially available routers shall be used to provide this isolation.
  10. The laboratory airflow control system shall support at least 20 networked devices in each pressurized zone.
  11. All points shall be available through the interface to the BMS for trending, archiving, graphics, alarm notification and status reports. Laboratory airflow control system performance (speed, stability and accuracy) shall be unaffected by the quantity of points being monitored, processed or controlled.
  12. Refer to the BMS specification for the required input/output summary for the necessary points to be monitored and/or controlled.
- H. Interface to Building Management Systems:
1. The supply, general exhaust, and lab hood exhaust controllers shall communicate over the building EMS LON Network without degradation in performance. The controller shall make all points (supply air temp, flow rate, valve position, etc.) available for reading over the Building EMS network on the Building EMS Graphical User Interface. Controllers not capable of communicating in this way will only be allowed if the same information is provided through a gateway provided by the lab controls manufacturer as detailed below:
    - a. The laboratory airflow control system network shall have the capability of digitally interfacing with the BMS. The required software interface drivers shall be developed and housed in a dedicated interface device furnished by the laboratory airflow control system supplier.
    - b. All room-level points shall be available to the BMS for monitoring or trending. The gateway shall maintain a cache of all points to be monitored by the BMS. The room-level airflow control devices shall update this cache continually.

## 2.5 WIRING

- A. Factory mount and wire VAV terminal unit controls. Mount electrical components in terminal unit control box with removable cover.
- B. Provide industry standard 1/4" male spade connectors on terminal unit controller for field wiring of thermostat, communications and power source.
- C. All wiring shall comply with local and national electric codes and the manufacturer's published installation manual.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components.
- C. Support units individually from structure. Do not support from adjacent ductwork.
- D. Connect to ductwork in accordance with Section 23 3100.
- E. Verify that electric power is available and of the correct characteristics.

### 3.2 LABORATORY TERMINAL UNITS

- A. The automatic temperature controls (ATC) contractor shall install the sash sensors, interface boxes, presence and motion sensor, and fume hood monitor on the fume hood under initial supervision of the laboratory airflow control system supplier. Reel-type sash sensors and their stainless-steel cables shall be hidden from view. Bar-type sash sensors shall be affixed to the

individual sash panels. Sash interface boxes with interface cards shall be mounted in an accessible location.

- B. The ATC contractor shall install all routers and repeaters in an accessible location in or around the designated laboratory room.
- C. The ATC shall install an appropriately sized and fused 24 Vac transformer suitable for NEC Class II wiring and shall extend power wiring to all electric actuators.
- D. All cable shall be furnished and installed by the ATC contractor. The ATC contractor shall terminate and connect all cables as required. The ATC shall utilize cables specifically recommended by the laboratory airflow controls supplier.
- E. The mechanical contractor shall install all airflow control devices in the ductwork and shall connect all airflow control valve linkages.
- F. The mechanical contractor shall provide and install all reheat coils and transitions.
- G. The mechanical contractor shall provide and install insulation as required on coil casings, duct transitions, coil headers.
- H. Each pressurization zone shall have either a dedicated, single-phase primary circuit or a secondary circuit disconnect.

### **3.3 LABORATORY UNITS AND CONTROLS SYSTEMS START UP AND TRAINING**

- A. System start-up shall be provided by a factory-authorized representative of the laboratory airflow control system manufacturer. Start-up shall include calibrating the fume hood monitor and any combination sash sensing equipment, as required. Start-up shall also provide electronic verification of airflow (fume hood exhaust, supply, make-up, general exhaust or return), system programming and integration to BMS (when applicable).
- B. The balancing contractor shall be responsible for final verification and reporting of all airflows.
- C. The laboratory airflow control system supplier shall furnish a minimum of eight hours of owner training by factory trained and certified personnel. The training will provide an overview of the job specific airflow control components, verification of initial fume hood monitor calibration, general procedures for verifying airflows of air valves and general troubleshooting procedures.
- D. Operation and maintenance manuals, including as-built wiring diagrams and component lists, shall be provided for each training attendee.

**END OF SECTION 23 3600**



**SECTION 23 3700  
AIR OUTLETS & INLETS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.

**1.2 REFERENCES**

- A. ARI 650 Air Outlets and Inlets.
- B. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- C. SMACNA HVAC Duct Construction Standard - Metal and Flexible.

**1.3 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

**PART 2 - PRODUCTS**

**2.1 SEE PLANS FOR GRILLE AND DIFFUSER SCHEDULE**

- A. Basis of Design – Price. Equals by Metal-Aire, Nailor, Tuttle & Bailey, and Titus.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and structural limitations.
- C. Connect diffusers to ductwork with airtight connection.
- D. Provide balancing dampers on duct take off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, grille or register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

**END OF SECTION 23 3700**

**SECTION 26 0500**  
**COMMON WORK RESULTS FOR ELECTRICAL**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. General Conditions of the Contract, Supplementary General Conditions, Instructions to Bidders, and General Requirements sections contained in the contract documents are a part of these Specifications.

**1.2 EXTENT OF THE WORK**

- A. This Contractor shall furnish all labor, materials, and equipment, and perform all operations necessary for installation of complete electrical work within the intent of, and as indicated on, the drawings and as herein specified.

**1.3 REGULATIONS AND COMPLIANCE**

- A. Latest editions of the National Electrical Code and the North Carolina State Building Code govern this work. All of their requirements shall be satisfied.
- B. This Contractor shall secure and pay for all permits, fees, inspections, and licenses required. The electrical contractor shall notify the Office of the State Electrical Inspector at the State Construction Office (SCO) (authority having jurisdiction), to schedule required electrical inspections including, but not limited to, rough-in, above ceiling, and final inspections. Upon completion of the job he shall present to the Engineer a certificate of inspection and approval from the inspection authorities.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. All materials shall be new, with required Underwriter's Laboratories (or other agency approved by the State) label, and with manufacturer's label or nameplate giving complete electrical data.
- B. Where a manufacturer's catalog number is used, all parts shall be furnished to make it complete and to fit the construction intended.
- C. Within ten days after award, Contractor shall submit to Engineer a complete list in triplicate of all materials he proposes to use. List shall show a single manufacturer with not only major materials and equipment, but also such items as conduit fittings, raceway supports, conductive pipe thread compound, asphaltum, sealing material, clamps, anchors, outlet boxes, gutters, terminal cabinets, wire-pulling compound, splice connectors, tape, wire markers, lamps, etc.
- D. Material shall be the make and number given in these Specifications or shown on Drawings, or equivalent where specifically stated as being allowed. Equivalent items or materials will be subject to acceptance by the Engineer at submittal stage. If Contractor wishes to furnish a substitute for the item(s) specified (or equivalent where allowed), he shall furnish complete, detailed data and obtain approval of the substitution in writing from the Engineer no later than ten (10) days prior to bid. In some cases, at the request of the Engineer, samples of the substitute items shall be submitted for review. Data (and sample if required) shall be submitted in a timely manner such that approval by Engineer can be returned to Contractor no later than 10 days prior to bid date. Data or sample not submitted in sufficient time to allow evaluation by Engineer will be automatically rejected.
- E. Engineer's review of samples, cut sheets, shop drawings, and other matter submitted by the Contractor shall not relieve the Contractor of responsibility for full compliance with the Drawings and Specifications. If a submitted item does not comply in any way (color, style, quality, function, or performance), Contractor shall call the specific non-compliance to the attention of the Engineer

in writing in a cover letter to the submittals requesting a deviation from specifications. This does not imply that approval of requested deviation will be given, only that it will be reviewed.

- F. Engineer's review of submittals is not intended to confirm quantity counts of materials and equipment made by Contractor. Contractor is required to provide quantities of items as necessary for systems to function as described and shown on the plans and in these specifications.
- G. Specialty systems such as fire alarm systems, etc., that are included as part of the Electrical Contract shall be furnished and installed by an authorized representative of the manufacturer of the equipment supplied. This includes use of factory trained and authorized installers where required to fulfill manufacturer's warranty provisions.
- H. Submit cuts of fixtures, shop drawings on panels, and other descriptive materials requested, in six copies, or as required by the General Requirements section. Submittals will not be accepted or reviewed by the Engineer unless the electrical contractor's stamp signifying his review and approval is evident on the submittals.
- I. Materials should be inspected upon their arrival at the site to be sure they are correct. No extension of time for completion will be allowed because materials received are wrong. Completely adequate housing shall be provided on the site for orderly and careful storage of all materials and equipment. Nothing shall be stored outside except conduit, which may be stored in racks so it is at least twelve (12) inches above ground and not subject to mud being spattered on it.

## **2.2 PAINTING**

- A. Suitable finish coatings shall be provided under this section of the Specifications on all items of electrical equipment and wiring which are exposed. This shall consist of either an approved factory applied finish or an acceptable finish applied during or after installation. Equipment which is furnished in finishes such as stainless steel or satin aluminum is not to be painted. Exposed equipment and/or wiring in finished areas such as panel covers or surface raceway shall be supplied with factory applied prime coat and shall be professionally painted or enameled as directed to result in a completely coated and attractively finished manner. All such finishing shall be as directed by and shall be satisfactory to the Architect and Engineer.

## **PART 3 EXECUTION**

### **3.1 GENERAL INSTALLATION**

- A. The electrical drawings are diagrammatic only, and are intended to explain system function and define quality of materials and installation. They are not intended to define construction methods.
- B. Contractor shall keep on the site at all times one set of electrical drawings and specifications, and one (1) set of drawings and specifications on the work of other trades. In addition, one (1) complete set of all electrical submittals and shop drawings shall be maintained at the site by the electrical contractor.
- C. The electrician shall check other trades' drawings, specifications, and shop drawings to see if there are any conflicts or discrepancies. If so, he shall contact the Engineer for instructions.
- D. The Contractor shall properly protect his work against damage by weather or other trades. All work shall be left well cleaned, and damaged finishes shall be restored to original condition.
- E. The Contractor shall place his own sleeves and notify other trades of chases and openings far enough ahead so they can be properly built in. Where any raceways, supports, etc., installed under the contract pierce the roof, suitable pitch pockets shall be provided and coordinated with the roofing contractor as necessary to be acceptable to the Engineer. Provide suitable fittings where any raceways or equipment cross expansion joints.
- F. This contractor shall be responsible for all trenching, backfilling, cutting, core drilling, and patching related to his work.

- G. Contractor shall provide firestops and smoke seals per Project Specifications and UL Details shown on drawings. All penetrations shall be sealed accordingly.
- H. Contractor should not scale drawings for outlet and equipment locations. Unless specifically dimensioned on drawings or defined in specifications, outlets and equipment shall be located as evidently intended or as detailed on Architectural drawings. Lighting outlets are to be centered or spaced symmetrically unless they are dimensioned. Any dimensions shown on the drawings shall be verified in the field by the contractor prior to roughing. All outlet and equipment locations shall be coordinated with the other trades. If any doubt arises, contact the Engineer prior to roughing.
- I. Contractor shall keep premises free of debris resulting from this work.

### **3.2 TESTS AND GUARANTEES**

- A. All current-carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. Each fixture and item of equipment for connection under the Contract shall be tested for insulation resistance from its conductors to its grounded surface or contact. These tests shall be done with a 500 volt (minimum) high voltage "megger."
  - 1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire, 250,000 ohms or more for #4 AWG and larger wire, between conductors and between conductor and the grounding conductor.
  - 2. After all fixtures, devices, and equipment are installed and all connections completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure or ground bar. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
  - 3. The Contractor shall send a letter to the engineer certifying that the above has been done and showing the tabulation of the megger readings for each panel or feeder. This shall be done at least four (4) days prior to final walk-through by engineer and SCO.
  - 4. At final walk-through by the engineer and SCO, the contractor shall furnish a megger and demonstrate that the panels comply with the above requirements. He shall also furnish a clamp-on type ammeter and a voltmeter to take current and voltage readings as directed by the engineer, or SCO representatives.
- B. Validity of the ground path shall be assured by constant and careful attention to the thorough tightening of all couplings, connectors, locknuts, screws, bolts, etc., and by frequent checking of the path resistance with a quality low-range ohmmeter. Resistance of the path should not exceed one ohm between any two points. If a reading in excess of this is observed, it shall be discussed with the Engineer for an appraisal of the condition.
- C. Contractor shall guarantee that the work is done in accordance with drawings and specifications, and that it is free of imperfect materials or defective workmanship. Anything unsatisfactory shall be corrected immediately and at Contractor's expense.
- D. For the period of one (1) year after acceptance by the Owner, the Contractor shall replace, without any expense to the Owner, any imperfect materials or defective workmanship.

### **3.3 RECORD DRAWINGS/MANUALS**

- A. Upon completion of the installation, Contractor shall submit to the Engineer marked prints of Drawings showing any changes made in circuits, location of equipment, panelboards, or any other revision in the Contract Drawings, for the Owner's use in maintenance work and for future additions

and expansions. Marked changes shall also include changes due to change orders unless already recorded by revised drawing or bulletin drawing.

- B. These record drawings shall be submitted in one (1) of two (2) formats: either a clean, legible, marked set of prints with all markings in distinguishable colored pencil such as red; or a set of reverse-run reproducible sepia prints marked in soft pencil so that blue-line prints can be reproduced as required. The format to be used shall be as defined in the General Requirements section of the contract documents. If no format is defined, the marked blue-line prints shall be submitted.

Operation and Maintenance manuals shall be submitted to the Engineer at the end of the project prior to closeout of the project. Information included shall be a copy of all submittal data, shop drawings, and necessary operating and maintenance instructions and wiring diagrams on all major items of equipment and all special systems (fire alarm, intercom, etc.). Submit these manuals in the quantities and format described in the General Requirements Section.

**END OF SECTION 26 0500**

## SECTION 26 0519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 GENERAL

##### 1.1 REQUIREMENTS

- A. All material shall be U.L. listed and shall be installed in conformance with the National Electrical Code.

##### 1.2 SUBMITTALS

- A. Shop drawings for:
1. Wiring
  2. Cabling
- B. Provide list of wiring and cabling types indicating where each type is used.

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. Manufactured by Southwire, Rome, or Triangle, or as otherwise noted in the specifications and drawings.
- B. Normal trade standard "building wire" of copper.
- C. Power and lighting circuits #10 AWG and smaller shall have solid copper conductors. Conductor sizes #8 AWG and larger shall have Class B stranded copper conductors. Maximum conductor size shall be 500 kCMIL.
- D. All sizes shall bear easily readable size and insulation grade marking along entire length.
- E. Insulation on #6 and smaller shall be suitably colored in manufacturing. Conductors #4 and larger may be identified with bands of proper color plastic tape near each termination and in each junction box.
- F. Insulation on service and feeders shall be 600 volt Type XHHW or THHN/THWN unless shown otherwise on the drawings.
- G. Branch circuits shall be a minimum of #12, with 600 volt THHN/THWN insulation unless noted otherwise in the specifications, specifically noted on the drawings, or Code requires another type. Circuit wires carried through rows of luminaires shall be at least Type THHN.
- H. Conductors in any location subject to temperatures higher than 60°C shall have insulation of a type approved by NEC for temperature encountered.
- I. Control and signal conductors shall be type and size indicated in those sections of the Specifications, or as indicated on drawings.
- J. Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drop on both feeders and branch circuits combined to the farthest outlet shall not exceed five percent (5%). Where the conductor length from the panel to the first outlet on a 277V circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from panel to the first outlet shall not be smaller than #10 AWG. Where ungrounded conductors are increased in size from the minimum size that has sufficient ampacity for the intended installation, wire-type equipment grounding conductors shall be increased in size proportionately according to the circular mil area of the ungrounded conductors.

#### PART 3 EXECUTION

### 3.1 INSTALLATION

- A. All wiring shall be color coded:
1. On 120/208 volt, 3 phase, 4 wire systems - phase A, black; phase B, red; phase C, blue; neutral, white. On 277/480 volt, 3 phase, 4 wire systems - phase A, brown; phase B, orange; phase C, yellow; neutral, natural gray. Ground conductor on all systems shall be green.
  2. Unless noted or accepted otherwise, busses in panels and switchgear shall be considered "A", "B", and "C" from left to right, top to bottom, or front to back when facing equipment.
  3. Control wiring shall not use black, red, or blue; but shall use white for neutrals and green for grounding. Any other colors may be used but the coding shall provide same color between any two terminals being joined.
  4. Switchlegs, including "travelers" in 3-way and 4-way switching systems, shall be same color as phase leg.
- B. Joints in #10 and smaller wire may be either made with approved twist-type connectors such as Ideal, Buchanan, T&B, Scotch, etc. "Stakon" or other permanent type crimp connectors shall not be used for branch circuit wiring.
- C. Joints in #8 and larger wire shall be made with approved Burndy, T&B, or O.Z. Manufacturing Co., mechanical pressure type connectors or lugs along with their UL approved insulating covers.
- D. Manufactured insulators for connectors may be used, provided they cover completely and securely all exposed metal. If joints and splices are taped, they shall be carefully covered with top-grade Okonite, Scotch Brand, or approved equivalent plastic or rubber and friction, laid on with half laps to result in a joint insulation equivalent to that of the conductor insulation.
- E. Circuit joints shall not be made on twin screws of convenience receptacles. Make joints as described above and run single leads to receptacle.
- F. All wiring lugs throughout the project, including, but not limited to, breakers, panelboard/switchboard lugs, safety switch lugs, and transformers lugs, shall be rated for use with 75 degree conductors sized in accordance with NEC Table 310.15(B)(16).
- G. Wm. Brady Co., or approved equivalent, labels or the type made with a punch on plastic tape, giving the circuit number, shall be securely fastened to each branch circuit conductor within panelboards. They shall also be installed on all conductors within junction boxes, pull boxes, gutters, wireways, cabinets, or equipment where two or more wires of the same color occur.
- H. Where connected under screw or bolt heads, stranded wire shall be fitted with a lug of proper size. Make solid conductor loops clockwise so as to be forced closed as screw is tightened. Only one solid wire loop may be held under a single screw.
- I. Make all connections tight.
- J. Wires within panelboards, terminal cabinets, and similar equipment shall be neatly squared.
- K. Where paralleling of conductors is shown for feeders or service entrance, it is absolutely required they be exactly the same length between points of bonding together. Lay out side by side and cut to same length before drawing into raceways. Provide for each end of run a Burndy Q2A or W3A lug, or approved equal, and terminate parallels in these without cutting.
- L. Individual branch circuits shall not to have shared neutrals.

**END OF SECTION 260519**

**SECTION 26 0523**  
**CONTROL-VOLTAGE ELECTRICAL POWER CABLES**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. All material shall be U.L. listed and shall be installed in conformance with the National Electrical Code Articles 700 and 725 of NEC.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Shall also conform with the following unless noted otherwise on drawings or in other sections of these Specifications:
1. Conductors shall be run in metal conduit, unless specifically stated otherwise. These shall be complete with outlet boxes, junction boxes, fittings, etc., conforming in all respects with Section 26 05 33.
  2. Conductors shall be #14 AWG minimum, stranded copper, and insulated with type THHN thermoplastic insulation rated for 600 volts unless noted otherwise in the specifications, specifically noted on the drawings, or Code requires another type.
  3. Conductors shall be colored in manufacture. Black, red, and blue shall be used only for connections of these wiring systems to proper phase in main wiring system. Color code throughout remainder of system shall be other colors selected by This Contractor, but same color shall be used between points of connection. In other words - do not change color at splices, in junction boxes, etc. White shall be reserved for neutral and green for grounding.
  4. In lieu of color coding, or in conjunction with, this Contractor shall identify each conductor using a label system, such as Brady labels, or equal. Each conductor shall be individually labeled with a distinctive number or number/letter combination at each termination point, including wire nut connections. A table shall be made identifying each conductor, its function, its origin, its final termination, etc. This table shall be typewritten and included in the final Operation and Maintenance Manuals and with a copy left in the main point of origin cabinet (such as fire alarm panel).
- B. Joints and connections shall be made as specified in Section 26 05 19.

**PART 3 EXECUTION**

THIS SECTION NOT USED

**END OF SECTION 26 0523**



**SECTION 26 0526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. All systems and equipment shall be grounded in accordance with NEC Article 250.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Manufactured by Thomas & Betts, Harger Lightning Protection, Lightning Master Corporation or approved equivalent.
- B. Bonding shall be done with #3800 series insulated bonding bushings and compression type lugs.
- C. Grounding conductor shall be THHN/THWN run in heavy wall conduit, and of size shown on drawings or required by NEC.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Any raceway anywhere in the system which enters a box or cabinet through part of a concentric or oversized knockout shall be fitted with an insulated bonding bushing and jumper. These bushings shall also be used wherever conduits stub into switchboards or transformer cabinets. Grounding type insulated bushings shall always be used on both ends of conduits feeding panelboards. The bonding jumper shall be sized by NEC Section 250 and lugged to the box.
- B. EMT couplings and connectors shall be compression-gland type of malleable steel, galvanized or sherardized. Connectors shall be insulated-throat type. Set screw, indenter, or cast type fittings are not acceptable.
- C. Attach rigid metal conduits with double locknuts - one inside and one outside - and fiber bushing, or in a threaded hub.
- D. The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per NEC Table 250.122, shall be run in ALL raceways except for telecommunications, data and audio conductors raceway.
- E. Ground all fixed and portable appliances and equipment connected under this Contract with a green grounding conductor. This wire shall be carried inside the raceway and flex from equipment to nearest grounded portion of raceway system. Connect at both ends with suitable lugs.
- F. All grounding type receptacles shall have a green wire jumper from their grounding terminal to box in which mounted. Attach jumper to box, not plaster ring, with a bolt or grounding clip. Jumper shall be sized by NEC with #12 minimum.

**END OF SECTION 26 0526**

**SECTION 26 0533**  
**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. All material shall be UL listed and shall be installed in conformance with the National Electrical Code.

**1.2 SUBMITTALS**

- A. Shop drawings for:
1. Conduits
  2. Couplings and fittings
  3. Boxes
  4. Conduit seals
- B. Provide list of conduit types indicating where each type is used.

**PART 2 PRODUCTS**

**2.1 RACEWAYS**

- A. Galvanized Steel Rigid Metal Conduit (RMC):
1. Heavy wall tubing with hot dipped galvanized coating
  2. Connections shall be made with double locknuts and bushings. Bushings to be steel with integral insulator except conduits 2" and below may have high impact thermoplastic Phenolic insulating bushings.
- B. Electrical Metallic Tubing (EMT):
1. Thin wall tubing with hot dipped galvanized coating.
  2. Couplings and connections shall be threaded steel, watertight gland compression type.
  3. All connectors shall have insulated throat.
- C. Flexible Metal Conduit (FMC):
1. Electro-galvanized single strip steel.
- D. Liquid Tight Flexible Metal Conduit (LFMC):
1. Electro-galvanized single strip steel with PVC coating.

**2.2 BOXES**

- A. Manufactured by Midland Ross/Steel City, T&B, Raco, or Appleton.
- B. Galvanized or aluminum of gauge required by NEC.
- C. All junction and pull boxes shall be 4 inch square by 2-1/8 inch deep minimum.
- D. Stamped steel boxes with knockouts are not acceptable for surface mounting in finished spaces in the building.

**2.3 FASTENINGS AND SUPPORTS**

- A. Shall be of good quality, galvanized steel, stainless steel, or other non-corroding material

**PART 3 EXECUTION**

**3.1 RACEWAY INSTALLATION**

- A. All wire and cable shall be run in raceway.

- B. Minimum raceway size shall be 3/4" (interior) and 1" (below grade) unless noted otherwise. Half inch flexible conduit may be used from junction box to above ceiling light fixtures (6' maximum length).
- C. All runs of empty conduit only shall have a 100# nylon pull rope installed in the conduit.
- D. Rigid metal conduit shall be made up with full threads to which T&B "Kopre-Shield" compound has been applied, and butted in couplings.
- E. Z. Split or "Erickson" couplings where necessary.
- F. No conduit shall be run in poured concrete floors or slabs. Conduit runs shall normally be run overhead. Where it is necessary to run underneath a concrete slab poured on-grade, conduit shall be buried in trench beneath gravel base and turned up through slab. Where it is necessary to run underneath a floor above a crawl space or another floor, conduit shall be run along ceiling space under floor and stubbed through floor using appropriate methods, such as "poke-through" devices or other means U.L. approved for such purpose.
- G. Underground runs, except under concrete floor slabs, shall be encased by a minimum of three (3) inches of concrete on all sides and shall have a minimum of eighteen (18) inch (non-roadway) and twenty-four (24) inch (roadway) cover, except for raceways containing circuits above 600V, which shall have a minimum cover of 30". Backfill shall be made in six (6) inch layers - tamping each layer to a density of 95% of maximum possible. Red dye shall be applied to the top of freshly placed concrete in all underground duct banks as a warning of electrical hazard in the event of future excavation. In addition, all underground raceway shall be identified by underground line marking tape located directly above the raceway at six (6) to eight (8) inches below finish grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compound for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- H. Where passing through a below grade wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/Gedney type "FSK" through wall fitting with "FSKA" membrane clamp adapter if required.
- I. Attach rigid metal conduits with double locknuts - one inside and one outside - and fiber bushing.
- J. Grounding type insulated bushings shall be used where raceway enters boxes with concentric or oversized knockouts. These bushings shall also be used wherever conduits stub into switchboards or transformer cabinets. Grounding type insulated bushings shall always be used on both ends of conduits feeding panelboards.
- K. Provide suitable fittings where raceway crosses building expansion joints.
- L. Securely fasten in place using approved strap or hanger within three feet of each termination and not over ten feet apart in runs.
- M. Run concealed in finished areas unless otherwise noted.
- N. Make all cuts square with hacksaw. Remove any burrs or shoulders by reaming.
- O. All runs exposed and all runs above accessible ceilings shall be neat and square with building structure such as walls and ceiling/roof structures. Multiple parallel runs shall use trapeze supports where possible.
- P. "Flex" and "Sealtite" connections with T&B "Tite-Bite" and "Super-Tite" or approved equivalent fittings. Shall have insulated throats.
- Q. Where installing raceway on interior surface of exterior walls. Mount raceway 1/4" from wall with clamp-backs or strut.

### **3.2 APPLICATION**

- A. Galvanized Steel Rigid Metal Conduit (RMC) required:

1. Installations below grade (and in or under slabs where approved), except where specifically noted otherwise.
  2. Below 6 ft AFF in exposed areas of mechanical equipment rooms, except where specifically noted otherwise.
  3. Installations exposed to atmosphere (including breezeways and similar locations).
- B. Electrical Metallic Tubing (EMT) Conduit required:
1. Interior partitions.
  2. Above suspended ceilings.
  3. Above 6'-0" AFF in exposed areas of mechanical equipment rooms, except where specifically noted otherwise.
  4. Sizes 2" and smaller except where specifically noted otherwise.
- C. Liquid Tight Flexible Metal Conduit required, not over 4'-0" in length, for final connections to:
1. Equipment in wet locations (including fire protection tamper and flow switches).
  2. Equipment with vibration isolation mounting.
  3. Equipment housing ferromagnetic cores or with integral moving components, capable of generating noise or vibrations including transformers and motors.
  4. Pumps and associated equipment.
  5. Instruments and control devices.
  6. All flexible connections to equipment in fire pump room below 60" AFF.
- D. Flexible Metal Conduit required, not over 4'-0" in length, for final connections to:
1. Equipment in dry locations.
  2. Equipment in dry locations with vibration isolation mounting.

### **3.3 BOX INSTALLATION**

- A. Attach EMT with connector only.
- B. Outlet boxes shall be sized in accord with NEC Section 314. All lighting outlet boxes shall have fixture studs. Device boxes shall be sectional type or 4" square equipped with plaster rings as required to mount the device. Set edge flush with finished surface. Boxes may be installed at top or bottom of a masonry course. Raco, or approved equivalent, masonry boxes in sawed block. 1-1/4" and deeper plaster rings may be of die-cast aluminum of Steel City make, or approved equivalent.
- C. Where installed in metal stud partitions, wall boxes shall be supported from two adjacent studs using a system such as Caddy Bar Hanger Assembly, or approved equivalent. Support on a single stud is not acceptable.
- D. Fixtures weighing more than six pounds shall be supported from the fixture stud.
- E. Where not shown differently on the drawings, mount:
1. Switch boxes 46" from finished floor to center. Boxes beside doors shall be mounted so edge of trim plate is 2" from edge of door trim on strike side.
  2. Telephone boxes 18" from finished floor to center and vertical. Boxes for wall phones shall be 46" from finished floor and vertical.
  3. Bracket light boxes as indicated on plans or as directed by Engineer.
  4. Clock outlet boxes 7'-0" from finished floor, or 6" below finished ceiling, to center.
  5. Panel cans 6'-4" (+4" in concrete block construction) from finished floor to top of can.
  6. Fire alarm pull stations 46" from finished floor to center.

7. Fire alarm chimes, horns, strobes, etc., 80" above finished floor or 6" below finished ceiling, whichever is lower, and shall comply with ADA requirements.
- F. Where not shown differently on the drawings, mount boxes for receptacles to receive device in a vertical position and be:
1. Centered 18" above finished floor.
  2. Centered 6" above counters, shelves, or cabinets where apparently intended to be so placed.
  3. Centered 4" above high edge of backsplashes.
  4. Where devices are to be ganged, provide boxes to receive devices trimmed with a gang plate.
- G. As soon as installed, all raceway openings shall be closed with plastic inserts to prevent entrance of foreign matter during construction. All enclosures shall be kept clean of any foreign matter. Install Jordan "Kover-All" plastic covers over outlet boxes ahead of plastering or painting.
- H. Conduit(s) from all boxes installed on exterior walls or in areas going from conditioned to unconditioned space shall have conduit(s) sealed with duct seal or equivalent to prevent moisture formation. Duct seal or equivalent shall also be installed in all raceways entering from exterior of building.

### **3.4 FASTENINGS AND SUPPORTS INSTALLATION**

- A. Inserts in masonry shall be lead, fiber, or plastic types installed in drilled holes. Wooden plugs shall not be used. Lead only shall be used on all exterior masonry or interior masonry subject to permanent moisture. Hung raceways shall be supported from the structure with rod supports at least 5/16" in diameter.
- B. All equipment and flat raceways attached to outside wall or interior walls subject to permanent moisture shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.
- C. All materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher.
- D. All fixtures, raceways, and equipment shall be supported from the structure. Nothing may be supported on suspended ceilings, including the hanger wires, unless definitely noted so on the drawings or specifically permitted by the Engineer.
- E. Recessed fixtures shall be supported at the two (2) opposite ends to the structure. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the fixture and the other end to the building's structural system. Lay-in fixtures shall also be screwed to the main runners of the lay-in ceiling track at all four corners using sheet metal screws.
- F. Recessed ceiling speakers, where specified with an enclosure, shall have the enclosure supported directly from the structure with a minimum of two 10 gauge wires run perpendicular to the ceiling and not pulling to one side. If recessed ceiling speaker is specified without an enclosure and is mounted in a suspended ceiling, the speaker shall be supported using T-Bar bridges such as Soundolier No. 81-8, or other device specifically designed for such support. In addition, each of the four corners of the ceiling grid block enclosing the speaker shall be supported from the structure using 10 gauge steel wire run perpendicular to the ceiling plane.
- G. Other devices using octagonal or 4" square ceiling boxes, such as smoke detectors, dome lights, exit signs, etc., where installed in suspended ceilings shall be supported from the ceiling system using Caddy, or other, hangers specifically designed for such support. In addition, each of the four corners of the grid block enclosing the box shall be supported from the structure using 10 gauge steel wires run perpendicular to the ceiling plane.

- H. Support for pipe straps or clamps shall be toggle bolts on hollow masonry; metal expansion shields and machine screws, or standard pre-set inserts, on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. The resulting fastening shall be completely secure.

**END OF SECTION 26 0533**

**SECTION 26 0553**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 NAMEPLATES**

- A. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment controlled or served, phase, voltage, etc.
- B. Furnish and install permanently mounted label on each device plate for receptacles indicating its panelboard and circuit number. Labels shall be made using electronic labeling system with black letters on clear background. Write-on labels are prohibited.

**PART 2 PRODUCTS**

**2.1 NAMEPLATE MATERIALS**

- A. Nameplate material colors shall be (conforms with State Construction Office requirements):
  - 1. Blue surface with white core for 120/208 volt equipment.
  - 2. Black surface with white core for 277/480 volt equipment.
  - 3. Bright red surface with white core for all equipment related to fire alarm system.
  - 4. Green surface with white core for all equipment related to "Emergency" systems.
  - 5. Brown surface with white core for all equipment related to data 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 concealed outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match color scheme outlined above. This includes covers on boxes above all type ceilings.

**PART 3 EXECUTION**

**3.1 NAMEPLATE INSTALLATION**

- A. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws, if sharp end is protected; otherwise, rivets shall be used. Nameplates shall identify equipment controlled, attached, etc. Letters shall be 1/2" high minimum for panel identification. Letters for other information shall be 1/4" high minimum. Embossed, self-adhesive plastic tape is NOT acceptable for marking equipment.
- B. Nameplates for legally required and optional standby electrical systems shall follow the nameplate color convention for the applied voltage noted above in 2.A.1. The text that defines component identification should also include the system application. For example, in an electrical distribution system with utility service and a generator having three (3) output breakers designated for emergency, legally required, and standby electrical systems, assuming Automatic Transfer Switch ATS-2 is part of the legally required system, then its nameplate should state:

LEGALLY REQUIRED ATS-2  
FED BY GEN-1 AND MDP

**END OF SECTION 260553**

**SECTION 26 0593**  
**ELECTRICAL SYSTEMS FIRESTOPPING**

**PART 1 GENERAL**

**1.1 REFERENCE**

- A. The work under this section is subject to the Contract Documents including General Conditions, Supplementary Conditions, and under Division 1 – General Requirements.

**1.2 SCOPE**

- A. Furnish and install work under this section including, but not limited to the following:
1. Penetrations through fire-resistance-rated floor, roof, walls and partitions including openings containing conduits, cables, cable bundles, cable tray and other penetrating items.

**1.3 SYSTEM PERFORMANCE REQUIREMENTS**

- A. Firestopping systems shall be UL Classified for the application and correspond to those indicated by reference to designations listed by UL Fire Resistance Directory.
- B. Firestopping systems and installation shall meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide fire rating equal to that of construction being penetrated.
- C. Proposed firestop materials and methods shall conform to applicable code authority having local jurisdiction.

**1.4 SUBMITTALS**

- A. Manufacturer's specifications and technical data for each material including composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.
- B. Material safety data sheets provided with product delivered to job-site.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design and intent to that indicated for Project and that has performed successfully.
- B. A manufacturer's direct representative to be on-site during initial installation firestop systems to train appropriate contractor personnel in proper selection and installation procedures.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product, type and UL label where applicable.
- B. Store materials to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.
- C. Handle with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

**1.7 PROJECT CONDITIONS**

- A. Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturer or when substrates are wet due to rain, frost, condensation or other causes.
- B. Ventilate firestopping per manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

**1.8 SEQUENCING AND SCHEDULING**



- A. Do not cover up those fire stopping installations that will become concealed behind other construction until authorities having jurisdiction, if required, have examined each installation.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. 3M, Hilti, Tremco, Nelson Firestop Products, Specified Technologies, Inc, or Rectorseal Corp.

### **2.2 MATERIALS**

- A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements and fire-rating involved for each separate instance.
- B. Materials shall not contain flammable solvents.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, for compliance with requirements for opening configurations, penetrating items and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPERATION**

- A. Clean out openings immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer.
- B. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- C. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- D. Do not proceed until unsatisfactory conditions have been corrected.

### **3.3 INSTALLATION**

- A. Comply with "System Performance Requirements" article in Part 1 and manufacturer's installation instructions and drawings.
- B. Install forming/backing materials and other accessories of types required to support fill materials during application as required. After installing fill materials, remove forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Avoid multiple penetrations of common fire barrier opening. When possible, seal each penetration in accordance with project details. When multiple penetrations are unavoidable, seal openings with appropriate UL Classified firestopping systems.

### **3.4 FIELD QUALITY CONTROL**

- A. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- B. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

### **3.5 CLEANING**

- A. Clean surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

**END OF SECTION 260593**

**SECTION 26 2416**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. Equipment shall be built to NEMA Standards where such standards exist.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Square D panelboards are specified as a basis for design. Equivalents by Cutler-Hammer or General Electric Co. may also be quoted.
- B. Types, sizes, capacities and characteristics shall be as shown on riser diagram or in schedules. Service equipment shall be labeled "UL Approved for Service Entrance Use".
- C. Branch circuit panelboards shall be bolt-on type, Square D NQ or NF types, or equivalent. Distribution panelboards shall be Square D I-Line types HCN, HCM, HCW, as indicated on plans, or equivalent.
- D. All breakers shall be fully rated. Series rating are not acceptable.
- E. Feed through panels shall not be used.

**2.2 CONSTRUCTION FEATURES**

- A. Housing shall be constructed of Code gauge galvanized sheet steel and shall be securely fabricated with screws, bolts, rivets or by welding. Housings for branch circuit panelboards shall be 20" wide and 5-3/4" deep. Housings for distribution panelboards shall be no larger than the panelboard specified as shown on the plans or the Contractor shall verify larger panelboard will fit and still maintain the proper Code clearances because space is at a premium.
- B. 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.
- C. Covers shall be constructed of high grade flat sheet steel of Code gauge minimum with the following:
1. Door-in-Door (Hinged) Trim Front.
  2. Door flush with face and closed against a full inside trim stop. Hinges shall be inside type.
  3. Combination flush latch(es) and Yale, Corbin or equivalent, tumbler-type lock(s), so panel door(s) may be held closed without being locked. All such locks on same job shall be keyed alike. Plastic lock type trims are not acceptable.
  4. Finish of manufacturer's standard color of top-grade enamel over a phosphatized or other approved rust inhibitor treatment and prime coat, or as specified in Section 26 05 00.
  5. Four (4) 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.
- D. A means of readily adjusting projection of panel interior assembly with all connections in place shall be provided. A method requiring stacking of washers is not acceptable.
- E. Interior trim shall fit neatly between interior assembly and cover - leaving no gaps between the two.
- F. Circuit breakers:
1. Circuit breakers shall be by the same manufacturer as the panel in which mounted unless specifically stated otherwise on the plans.
  2. Breakers shall be equipped with specific accessories, such as shunt trip, handle lock, etc., as indicated on plans.

3. Individual breakers shall be securely and tightly mounted on their supporting structure so they do not depend upon the current-carrying bus for support, unless a combination support/bus is considered adequately strong by the Engineer.
  4. Breakers in lighting and branch circuit panels shall be "Quicklag" type bolted to the supply bus. Plug-in types are not acceptable.
  5. Breakers in distribution panels shall be molded-case thermal-magnetic type unless specifically indicated otherwise on plans. Multi-pole breakers shall have common tripping of all poles.
  6. Breakers shall have factory installed mechanical type lugs to accept solid or stranded type conductors and shall be rated for use with wire rated at 75 degrees C.
  7. All molded-case circuit breakers shall be labeled as meeting U.L. 489.
  8. Circuit breakers 400A and greater shall be electronic trip type, molded case, individually mounted breakers, listed under U.L. 489. Breakers shall be 80% rated (unless noted as 100% rated in schedule) with field interchangeable rating plugs as stated on the drawings. U.L. listed interrupting rating shall be the same as for the main breaker.
- G. 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".
- H. All panels shall have 100% rated copper busses and neutral bar, with substantial connections where breakers bolt to busses.
- I. All wiring lugs in panelboards and all breakers shall be rated for use with 75 degree conductors sized in accordance with NEC Table 310.15(B)(16).
- J. All branch circuit panels shall be equipped with 100% rated copper ground busses.
- K. Breakers in lighting or branch circuit power panelboards shall be physically arranged in locations shown in panel schedules and be connected to the phases shown. Any deviation shall be approved by the engineer in advance. Panelboards shall be equipped with directory cards mounted behind heavy clear plastic shields in substantial frames attached to inside face of doors. Cards shall be a minimum of three (3) inches wide.
- L. Panelboard manufacturer shall determine the flash protection boundary and the incident energy for the electrical equipment in accordance with IEEE 1584 and NFPA 70E requirements and shall provide labels for each panel with the required information accordingly.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Flush-mounted panel housings shall be flush with finished wall.
- B. Mount equipment plumb and level.
- C. Openings in boxes, cabinets, or gutters shall be cut or sawed. Burning of openings is prohibited.
- D. Each lighting or branch circuit panelboard mounted flush in a wall shall have a minimum of five empty 3/4" conduits stubbed out into the ceiling space above panel for future use unless all circuits in a panel are assigned. Seal ends of conduit with caps or with UL approved fire stopping material.
- E. Only one (1) solid wire is allowable under a screw. Use lug for connecting stranded wire or more than one solid conductor.
- F. Label all equipment in conformance with Section 26 05 53.
- G. 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.

- H. Next to each breaker within main or distribution panelboards, attach a phenolic label indicating what it feeds. Wording shall be as shown on its diagram or schedule. Labeling shall also be attached to separately-mounted breakers, switches, transformers, wiring gutters and controllers of all types.
- I. 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". See Section 26 05 53 for details.

**END OF SECTION 26 2416**

**SECTION 26 2726**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.1 WIRING METHOD FOR BRANCH CIRCUITS**

- A. Outlets in the same general area are circuited together. Circuit numbers are shown as noted in symbol schedule.
- B. Unless shown differently, 120 or 277 volt branch circuits on single or three phase systems shall be limited to three (3) phase conductors per raceway. Three phase circuits shall be limited to one circuit per raceway (three (3) different phase wires and neutral(s) if needed).
- C. Individual neutral wires shall be provided for each circuit (no sharing of neutrals between circuits). Install individual neutral(s) where existing circuit(s) are extended.
- D. The neutral carrying all or any part of the current of any specific load or run shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current. No split neutrals permitted.
- E. Circuits shall be connected to panels as shown in the panel schedule. Any deviation shall be approved in advance by the engineer.
- F. Under the above requirements and with required color coding system no feeder or branch circuit raceway will contain more than one wire of the same color, except for switch legs and control circuits.
- G. Conductors feeding lighting outlets may be combined in the same raceway with conductors feeding convenience receptacles; but lighting outlets and convenience receptacles shall not be put on the same circuit unless specifically indicated.
- H. Toggle switches shall be single pole, three-way, or four-way as indicated on drawings. Switches shall be of grounding type, with hex-head grounding screw, rated 20A, 120/277V, AC only. All switches shall have quiet operating mechanisms without the use of mercury switches. All switches shall be listed by an "approved" third party agency, approved for the voltage and amperage indicated.
- I. Duplex receptacles shall be of the grounding type, arranged for back and side wiring, with separate single and double grounding terminals. Receptacles shall be straight blade, rated 20A, 125V and the face configuration shall conform to the NEMA Standard WD-1, NEMA WD-6, DSCC W-C-596G and UL-498, and shall be "approved" third party listed. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.
- J. Receptacles shall be industrial specification grade or heavy duty grade, mounted vertically. Receptacles mounted over counters, back-splashes and where specifically noted otherwise shall be mounted horizontally.
- K. Receptacles shall not be mounted back to back.

**PART 2 PRODUCTS**

**2.1 WIRING DEVICES**

- A. Switches considered equivalent are as follows:
  - 1. Single Pole: Hubbell 1221  
Bryant 4901  
P & S 20AC1  
Leviton 1221

Eagle 2221

B. Duplex receptacles considered equivalent are as follows:

1. Heavy Duty Specification Grade:

Hubbell 5362

Bryant 5362

P & S 5362

Leviton 5362

Eagle 5362

C. The color of all devices shall be verified with Architect. Samples will be required prior to acceptance of any proposed equivalents not specifically mentioned above. All like devices shall be by the same manufacturer (i.e.; all switches, all duplex receptacles, etc.).

D. Unless noted or specified otherwise, device trim plates shall be type 302 stainless steel to suit device. All plates in the job shall be same make and match throughout.

E. Ground fault interrupter type duplex receptacles shall be heavy duty specification grade. Where used outdoors, they shall be the weather-resistant type, as well as ground fault unless otherwise indicated. They shall have extra duty rated weather proof while-in-use protective covers.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

A. Devices shall be mounted tightly to boxes and be adjusted plumb and level.

B. Receptacles are to be installed in the vertical position with the ground terminal on top.

C. Two or more devices ganged shall be trimmed with gang plate.

**END OF SECTION 26 2726**

## SECTION 26 2900

### MOTORS, CONTROLLERS, AND EQUIPMENT CONNECTIONS

#### PART 1 GENERAL

##### 1.1 REQUIREMENTS

- A. Motors, controllers, and other special equipment are sometimes provided and installed by other trades. This section specifies typical connections to that equipment.
- B. All individual motor starters or VFD's for plumbing & mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Divisions 22 & 23 (Plumbing & Mechanical Contractors) unless indicated as a part of a motor control center. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Division 26 (Electrical Contractor). Under Division 26, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter, VFD or disconnect switch. Under Division 26 line side terminations shall be provided. Wiring from the termination point to the plumbing or mechanical equipment, including final connections shall be provided under Divisions 22 & 23.
- C. Where electrical wiring is required by trades other than covered by Division 26, the installer shall refer to the wiring materials and methods as specified under Division 26.

#### PART 2 PRODUCTS

##### 2.1 EXHAUST FANS

- A. Exhaust fans are indicated by special symbol on plans. Unless otherwise noted, they will be furnished and set by others and connected by the Mechanical Contractor. Controller will be provided by others unless controller is specified on electrical drawings. Electrical contractor shall provide a local disconnect switch at fan if unit is not provided with one. Where indicated as controlled from several double pole switches, the second pole of each switch shall be connected in parallel so fan will run when any one or more of the switches is on.

##### 2.2 UNIT HEATERS

- A. Unit heater, ventilator, cooler, or similar outlets - designated by special symbol - are located approximately on drawings. Exact location of outlet shall be obtained from Heating, Ventilating, and Air Conditioning Contractor. Unless indicated otherwise, outlet shall be a 4" box fitted with an oversized blank cover with 1/2" center knockout, mounted in wall or ceiling, and fed on circuit shown beside symbol. These outlets shall be located behind or within equipment cabinets where possible and still be accessible. Provide local disconnect switch if one is not provided with unit. Unless specified otherwise herein or on drawings, power connection from outlet to equipment will be by Mechanical Contractor. Control wiring will be done by the Mechanical Contractor.

##### 2.3 TROUGHS

- A. Electrical troughs, junction boxes, switches, or breakers for air conditioning, heating, or plumbing equipment are indicated on drawings. Exact locations shall be obtained from Heating and Air Conditioning or Plumbing Contractors but Code clearances shall be maintained. Unless specifically noted otherwise, all power wiring for equipment and controllers beyond these points will be done by Heating and Air Conditioning or Plumbing Contractors. Control wiring will be by Heating and Air Conditioning or Plumbing Contractors.

##### 2.4 OTHER

- A. Other equipment connections are generally indicated on drawings by a circled black triangle with a letter suffix. These are then defined in notes or details. Where catalog numbers, models, or types, and manufacturer's name are given, these items of equipment shall be furnished and installed by the Electrical Contractor, unless specifically noted otherwise.

- B. Junction box - designated as a circled J. Size of such boxes is generally noted on drawings. Where this is not done, they shall be sized in accord with NEC and purpose evidently intended.
- C. Where unscheduled junction boxes are used by Contractor to facilitate wiring or to comply with limits of elbows and bends, they shall be concealed if at all possible to do so and still be left accessible. If this is impossible, they shall be recessed in walls or ceilings and provided with an oversized cover which shall be painted out to match adjacent surfaces. If it is necessary to mount such boxes exposed, the location shall be approved by the Engineer.
- D. All contactors, motor starters and combination type starters specified under this contract shall be equipped with Hand-Off-Automatic switches, pilot (run indicating) light, 120 volt control transformer, and two sets of auxiliary contacts. The switch and light shall be located on the unit cover. Starters shall be Square D, Cutler-Hammer, General Electric Co., or equivalent by others.
- E. All safety switches shall be heavy-duty type, NEMA 1 for indoor and NEMA 3R for outdoor use unless specifically stated otherwise. They shall be fused type unless specifically indicated otherwise on plans. Fused type (600 volts or less) shall be equipped with the following: Service Entrance and Feeder Circuits over 600A – Class L, UL Listed, current limiting with 200K interrupting rating; Service Entrance and Feeder Circuits 600A and less – Class RK1 or J, UL Listed, current limiting with 200K interrupting rating; Motor, Motor Controller and Transformer Circuits – Class RK5, UL Listed, current limiting time delay with 200K interrupting rating; and individual Equipment where fault current does not exceed 50kA – Class K5, UL Listed, with 50K interrupting rating. Fusible safety switches with short circuit withstand rating of 100K or 200K shall include Class R or Class J rejection fuse block feature. Switches shall be equipped with defeatable door interlocks and padlocking provisions in the on and off positions. Padlocks shall be provided for switches located in public areas. Switches shall be by Square D, Cutler-Hammer, General Electric Co., or equivalent by others. In addition, safety switches shall be provided with the following requirements or features:
  - 1. Safety switches shall be third party listed.
  - 2. Switches shall have door interlocks that prevent the door from opening when the operating handle is in the “on” position.
  - 3. Switches shall have handles whose positions are easily recognizable in the “on” or “off” position. For safety reasons, padlock shall be provided for switches unless they are located in a locked electrical room.
  - 4. Switches shall have positive quick make-quick break mechanisms.
  - 5. Switches shall be properly labeled. Refer to Specification 260553.
  - 6. The Electrical contractor is to provide to the Owner as spares, 10% of the quantity of fuses used of each type and rating, with a minimum of one (1) set of each type.
- F. All safety switches, motor starters, or other boxes or panels, designated as NEMA 3R or otherwise intended for outdoor use or use in wet areas, shall use rain-tight conduit hub fittings with bonding screw.
- G. Control wiring shall not be installed in the same raceways as power wiring.

**END OF SECTION 26 2900**



**SECTION 26 5000**  
**LIGHTING**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. The following specification applies to the general building lighting system.
- B. Lighting systems shall comply with the 2018 NC Energy Code and NC Senate Bill 668.
- C. Types and manufacturers are scheduled on the drawings. Equivalent luminaires by others may be submitted only as indicated on the plans and are subject to the conditions in Section 26 05 00.
- D. All luminaires shall be UL listed and labeled.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. A complete lighting system will be provided consisting of area, emergency egress, and emergency exit lighting. These systems will include LED lighting. These systems will also include switches and automatic controls (occupancy sensors, automatic lighting shutoff systems, dimming systems, etc.) as necessary to provide the necessary lighting levels while complying with or exceeding the Energy Code requirements. Power for emergency egress lighting shall be provided by the emergency generator.
- B. LED luminaires shall comply with the latest guidelines for best practices in retrofit installations as described in the NC SCO document – Energy Efficient Lighting Guidance Document for New Construction and Retrofits: The State of North Carolina (Rev. March 2016).
- C. Catalog numbers are for general identification of luminaires only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., to fit them properly to the construction, shall be furnished and installed.
- D. A lighting luminaire shall be provided for every lighting outlet indicated. Any omission shall be brought to the attention of the Engineer before submitting proposal; otherwise a unit selected by the Engineer shall be furnished and installed at no additional charge.
- E. All luminaires shall be grounded per NEC.
- F. Luminaires connected with flex to the rigid raceway portion of the wiring system shall carry a green bonding jumper within the flex. The jumper shall be fastened to both the luminaire and the raceway system with a Steel City "G" clip or approved equivalent. Phase and ground conductors run in a flex shall be #12 minimum.
- G. Surface-mounted luminaires being installed on combustible material shall be mounted at least 1-1/2" from the surface of the material; except units which are plainly marked on luminaires as U.L. approved for mounting directly to such surfaces.
- H. Mount all luminaires plumb and square. Keep rows in perfect line.
- I. Manufacturers shall be regularly engaged in the manufacture of lighting luminaires of types and ratings required, shall have a service organization in the continental US, and shall have products that have been satisfactorily used in similar service for not less than five (5) years. The manufacture of the luminaires shall comply with the provisions of all applicable Codes and Standards. All luminaires shall be tested prior to shipping.
- J. All LED luminaries shall meet the NEMA 410-2011 standard for inrush current and shall be less than 20% total harmonic distortion. Provide a minimum of 2.5-KV surge suppression integral with the driver. All luminaires shall be listed on the LED Lighting Facts website ([www.lightingfacts.com](http://www.lightingfacts.com)), Energy Star website ([www.energystar.gov](http://www.energystar.gov)), or the Design Light Consortium website ([www.designlights.org](http://www.designlights.org)). All integrally manufactured (not modular) products shall have a minimum

10-year warranty. For modular manufactured products (separate LED elements and drivers) shall have a 10-year warranty for LED elements and minimum 5-year warranty on drivers.

K. Indoor LED Luminaires:

1. Construction/Finish: No visible welding, no plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side are allowed.
2. Maintenance: Power supplies, drivers, ballasts, LED arrays, boards and light engines shall be easily field replaceable using common hand tools (e.g. screw drivers, pliers, etc.) and without uninstalling the luminaire.
3. Electrical and Photometric Requirements:
  - a) Operating Voltage: 24 VDC, 120 VAC at 60 Hz, 277 VAC at 60 Hz, or universal voltage (120, 220/240, 277 VAC at 50/60 Hz).
  - b) Power Factor:  $\geq 0.90$  (at full luminaire output and across specified voltage range).
  - c) Total Harmonic Distortion:  $\leq 20\%$  (at full luminaire output and across specified voltage range).
  - d) Transient and Surge Protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV.
  - e) Sound: Class A not to exceed a measured value of 24dBA.
  - f) Maximum Standby Power: 1W.
  - g) Warranty: Five (5) years, non-prorated on complete luminaire including driver.
  - h) LED arrays in product(s) shall be considered defective in material or workmanship if a total of 10% or more of the individual light-emitting diodes in the product(s) fail to illuminate during normal operation after installation.
  - i) LED Power Supply/Driver:
    - 1) Driver efficiency (at full load):  $\geq 85\%$  for drivers capable of  $\geq 50$  Watts, 80% for drivers capable of  $< 50$  Watts.
    - 2) Federal Communications Commission (FCC) compliance: FCC 47 Part 15 Non-Consumer limits for EMI/RFI emissions.
  - j) Temperature Rating: Each luminaire shall be designed to operate at an average operating temperature of 25°C. The operating temperature shall be 0°C to 25°C.
  - k) Thermal Management:
    - 1) The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
    - 2) The LED manufacturer's maximum junction box temperature for the expected life shall not be exceeded at the average operating ambient temperature.
    - 3) The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient temperature.
    - 4) The driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating temperature. Thermal management shall be passive by design. The use of fans or other mechanical cooling devices shall not be allowed.
  - l) Flicker Criteria: IESNA, IEEE PAR1789.
  - m) EMI/RFI: The luminaire and associated on-board circuitry shall meet Class A emission limits per FCC Title 47, Subpart B, Section 15 Non-Consumer Requirements for EMI/RFI Emissions.
  - n) Inrush Current: NEMA 410.

- o) Colorimetric:
  - 1) Correlated Color Temperature (CCT): Only allowed CCTs are: 2700K, 3000K, 3500K, 4000/4100K, and 5000K unless specifically noted otherwise.
  - 2) Tolerances shall meet ANSI C78.377-2015 (LED).
  - 3) Color Rendering Index (CRI) [ $R_a$ ]  $\geq 80$  with a positive  $R_g$  value.
  - 4) Color shift shall be minimal.

## **2.2 EXIT SIGNS AND EMERGENCY LIGHTING**

- A. Emergency lighting and exit signs are as specified and located on plans. All exit signs shall be LED type.
- B. the system shall be fed from the Emergency Power Distribution System which is supplied by utility under normal conditions and automatically transferred to the emergency generator system upon utility power failure.
- C. Failure of any one element, such as a lamp, shall not result in loss of illumination from any fixture used for emergency egress lighting.
- D. The emergency power wiring shall be a complete system in itself and shall be kept entirely separate from any other wiring in the project.

## **PART 2 EXECUTION**

### **2.1 INSTALLATION**

- A. Installation shall meet the requirements of previous sections of these specifications.
- B. Installation shall meet manufactures installation instructions.
- C. Mount all luminaires plumb and square. Keep rows in a perfect line.
- D. Install lamps in each luminaire.
- E. Bond and ground luminaire metal accessories and metal poles in accordance with the NEC and per Section 260526. Install supplementary grounding electrode at each pole.

### **2.2 SUBMITTALS**

- A. Lighting submittal shall include all proposed luminaires, controls, and accessories. Incomplete submittals will be rejected.

### **2.3 DELIVERY**

- A. Equipment shall be delivered to the jobsite with protective wrappings and/or packing to protect factory applied final finishes.

### **2.4 CLEANING**

- A. Clean photometric control surfaces as recommended by manufacturer.
- B. Clean finishes and touch up damage with manufacturer's approved paint or coating materials.

### **2.5 SPARE PARTS**

- A. 1% of each type of LED driver (minimum of one (1) unless noted otherwise).
- B. Two (2) of each type of LED light engine.
- C. 10% of each type of occupancy sensor.
- D. 2% relays and one (1) extra circuit board for each type of lighting control panel.
- E. Parts list for all luminaires provided that includes LED light engines, LED drivers, etc. with part numbers shall be included in closeout documents.

**END OF SECTION 26 5000**

**SECTION 27 0500**  
**COMMON WORK RESULTS FOR COMMUNICATIONS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. Division 27 Communications specifications are intended to include a complete telecommunications infrastructure for the facility. The scope for this project is for the Contractor to provide raceways and boxes as documented in the drawings and specifications. Cabling and associated equipment (including network electronics (switches, routers, wireless access points), telephones, VoIP instruments, and patch cables) will be provided by the Owner.
- B. Standards. All work shall be in accordance with the latest edition of all applicable campus, State, and Federal regulations and codes. Special considerations should be made to comply with NEC, NFPA, and North Carolina State Construction Office requirements. All work shall also be in accordance with the latest versions of the BICSI TDMM manual and TIA-569 standard. All work shall comply with University Wiring Standard 3.0.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. The materials used for this system are to be manufacturer and part number specific with no substitutions, unless specified as accepting "or equal." See Design and Construction Guidelines – Division 27 - Communications for a list of materials acceptable for use in North Carolina State University projects.
  - 1. [https://facilities.ofa.ncsu.edu/files/2015/02/division27\\_communications.pdf](https://facilities.ofa.ncsu.edu/files/2015/02/division27_communications.pdf)

**END OF SECTION 27 0500**

## SECTION 27 0526

### GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS

#### PART 1 GENERAL

##### 1.1 REQUIREMENTS

- A. Grounding and bonding for communications systems are supplemental to the electrical power grounding system and devoted to the communications system infrastructure. Bonding and grounding of telecommunications systems is a requirement in each building on campus. Its purpose is to protect personnel and equipment from unwanted electrical currents associated with the communications infrastructure and equipment.
- B. Grounding and bonding responsibilities are divided and shared between the electrical contractor and the communications contractor.
- C. Grounding and Bonding applies to all communications systems elements, but especially to the following specifications:
  - 1. SECTION 27 05 36 RACEWAY FOR COMMUNICATION SYSTEMS
- D. Standards. All work shall be in accordance with the latest versions of the BICSI TDMM manual and TIA-607 standard, and with manufacturer's recommendations. All work shall comply with all applicable NFPA and NEC requirements. All work shall comply with University Wiring Standard 3.0, and Section 27 05 26 BDF/IDF Grounding and Bonding for Communication Systems.

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. The materials used for this system are to be manufacturer and part number specific with no substitutions, unless specified as accepting "or equal." See Design and Construction Guidelines – Division 27 - Communications for a list of materials acceptable for use in North Carolina State University projects.
  - 1. [https://facilities.ofa.ncsu.edu/files/2015/02/division27\\_communications.pdf](https://facilities.ofa.ncsu.edu/files/2015/02/division27_communications.pdf)

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

- A. Bonding Conductor for Telecommunications (BCT): The bonding conductor for communications shall bond the TMGB to the main electrical service (power) grounding system. The BCT originates in the MDF and terminates at the electrical service ground for the building. The BCT shall be a continuous copper conductor sized according to length. This conductor shall be installed in EMT, bonded to the conduit at each end and be sized, as a minimum, the same size as the TBB.
- B. Telecommunications Bonding Backbone (TBB): This conductor interconnects the TGB with the TMGB. The TBB shall be routed in a separate conduit alongside the telecommunications riser cables. The TBB shall be insulated and be a continuous conductor without splices. The TBB shall be a copper conductor with a minimum conductor size of 6 AWG and be specified in NCSU UWS 3.0.
- C. Installation Compliance: Provide grounding connections for cable systems as required by manufacturer's recommendations and in compliance with TIA-607-C and as required by the NEC.
- D. Telecommunications Infrastructure Bonding: Bond all installed equipment racks, cable tray, and other metallic components to grounding bus bar in telecom room with a minimum 6 AWG copper conductor with green colored insulation.
- E. TBB Sizing Requirements:

1. The TBB should be sized per the table below with the TBB length calculated from the last TGB in the run to the TMGB.

<b>TBB Length (LF)</b>	<b>TBB Size (AWG)</b>
Less than 13	6
14-20	4
21-26	3
27-33	2
34-41	1
42-52	1/0
53-66	2/0
Greater than 66	3/0

- F. Telecommunications Grounding Busbar (TGB): The TGB is the interface to the building telecommunications grounding system located in each IDF and serves as the communications grounding system for that room. It shall be installed onto the wall-mounted plywood at 7' 6" AFF. The bar shall be electrically insulated from its mounting hardware. In addition to being bonded to the TMGB, the TGB shall be bonded to building steel if available. This does not apply to buildings constructed of reinforced concrete.
- G. Wireway: A #6 AWG TBB conductor shall be installed for the TGB to the wireway with each section bonded together per manufacturer and NEC requirements.
- H. Pathway Components: A #6 AWG TBB insulated grounding conductor shall be installed to each pathway component per manufacturer and NEC requirements.
- I. Equipment Cabinets and Racks: A #6 AWG TBB insulated grounding conductor shall be installed between the TMGB or TGB and all equipment racks.
- J. Interconnection with Building Ground: The grounding system for telecommunications is for telecommunications systems only. No other building or system grounds may be made to the TMGB, TGB, or communications systems components.

**END OF SECTION 27 0526**

**SECTION 27 0536**  
**RACEWAYS FOR COMMUNICATION SYSTEMS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. Pathway systems. A horizontal pathway system shall be installed in campus buildings to route and protect all telecommunications cabling from the MDF/IDF to the outlets in all work space locations. Unless otherwise noted, all cabling for University properties shall be housed in conduit/backbox systems (as opposed to surface mounted or hung cabling). The scope of conduit/backbox use includes cabling for voice and data communications, CATV, elevator emergency phone, security cameras, fire alarm phone lines, automatic transfer switches, emergency generators, and miscellaneous building and freezer alarm lines.
- B. Standards. All work shall be in accordance with the latest edition of all applicable campus, State, and Federal regulations and codes. Special considerations should be made to comply with NEC, NFPA, and North Carolina State Construction Office requirements. All work shall also be in accordance with the latest versions of the BICSI TDMM manual and TIA-569 standard, and with manufacturer's recommendations.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. The materials used for this system are to be manufacturer and part number specific with no substitutions, unless specified as accepting "or equal." See Design and Construction Guidelines – Division 27 - Communications for a list of materials acceptable for use in North Carolina State University projects.
  - 1. [https://facilities.ofa.ncsu.edu/files/2015/02/division27\\_communications.pdf](https://facilities.ofa.ncsu.edu/files/2015/02/division27_communications.pdf)

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Fire safety considerations. The installation of raceways and conduits shall comply will all applicable fire safety and electrical codes. In general, the North Carolina State Construction Office determines the compliance of these systems with codes, and they reserve the right to inspect and approve/disapprove their installation. The horizontal pathway system shall be a combination of cable trays installed in the ceiling areas of the building from the BDF/IDF with 1" conduit run to each work space outlet. The riser pathway system shall be a completely enclosed metallic conduit system between the BDF and all IDFs. All conduit penetrations of rated walls and floors shall be fire-stopped per applicable UL assembly.
- B. Horizontal pathway sizes. Typically the horizontal pathway system will consist of a network of wireways installed in the ceiling areas of the building with 1" conduits run to each work space outlet. All horizontal cabling is run in a star topology (homerun) from each outlet back to the nearest IDF or BDF.
  - 1. Each Telecommunications outlet will have a 1" minimum EMT conduit routed from the recessed outlet box that extends to the wireway.
  - 2. Conduit Bends: A maximum of 180 degrees will be allowed between pull points. Conduit runs exceeding 180 degrees of turns require the installation of a fully accessible pull box to facilitate cable installation. The use of LB-type or similar conduits is not permissible.
  - 3. Box Size: Telecommunications outlets shall be double gang 4" X 4" X 2-1/8" deep and shall be fitted with a double gang plaster ring to facilitate the installation of a double gang telecommunications faceplate. Outlets shall be installed at 18" AFF and/or shall be level with

nearby electrical outlets. In cases where outlets are installed above countertops the outlet height shall be noted on the drawings.

- C. Maximum horizontal pathway length. The maximum length of the horizontal cable channel is limited to 295 ft. (90m). Since this channel includes patch cords at the outlet and in the IDF and also the cable slack loop installed in the IDF, the actual length of the horizontal pathway is somewhat shorter. A good rule of thumb to use in designing these pathways is the "250 ft. rule". The pathway run from the outlet box farthest from an IDF back to where the wireway penetrates the wall of that IDF shall not exceed 250 ft. It is imperative that this calculation includes allowances for the vertical conduit run from the wireway to the outlet box and for the vertical and horizontal deviations in the wireway routing.
- D. Routing. Typically, wireways are routed in corridors or other publicly accessible areas of the building. Normally, they are routed in the ceiling areas, above acoustic tile ceilings when possible. Routing of wireways through occupied spaces is discouraged, but may be required due to utility conflicts or hard ceilings.

Also, there are areas of buildings that shall typically not be used for wireways or routing. These include:

1. Stairwells.
  2. Elevator shafts and equipment rooms.
  3. Outdoor areas (including covered breezeways) where moisture may be present. The cabling to be installed has no water resistance characteristics.
  4. Wet areas inside buildings such as shower facilities, equipment wash down areas, steam rooms, etc.
  5. Hazardous locations. Since the wireways need to remain accessible for technicians to install cabling on an ongoing basis, routing through areas exposing personnel to dangerous heights, high voltage equipment, hazardous chemicals, etc. shall be avoided.
  6. Locations with excessive heat. The cabling to be installed in these pathway systems is not designed to withstand excessive heat. Wireways and conduits shall be routed to avoid heat sources hot enough to cause sheath deformation over time in the cables.
  7. Confined spaces. Wireways shall not be routed in spaces that are designated as confined spaces requiring special permitting or safety precautions for entry.
  8. EMI sources. Wireways and conduits shall be located away from extraordinary sources of electromagnetic interference (EMI).
- E. Access. In areas of buildings where acoustic tile ceilings are present, the wireway system is typically installed between the top of the grid and the deck above. In these applications, the bottom of the support structure (trapeze) shall be installed at least 3" above the grid. In areas without acoustic tile ceilings, the wireway system shall be installed exposed with the bottom of the support structure at least 8'- 6" AFF. Wireways shall not be installed above inaccessible (hard) ceilings.

The wireways shall be installed to maximize accessibility for future cable and conduit installations. A minimum of 24" accessible workspace shall be maintained on one side of the wireway.

- F. Conduit requirements. A maximum of 180 degrees between pull points shall be maintained in all conduit runs. For 4" riser conduits, install 48" long sections of 6"x 6" wireway in straight sections of the conduit runs to create pull points. The 4" conduits shall be connected to the end cap of each end of the above wireway sections. Plastic bushings are required on all conduit ends. These pull points shall be located to provide the maximum possible access for cable installation by technicians. Junction boxes shall not be installed in lieu of conduit bends without the approval of NCSU Comtech.
- G. Cabinet connections. For cabinet type IDFs, all conduits shall be connected directly to the junction box (shared with horizontal cables) mounted above the cabinet.



- H. Aesthetics. All visible system elements shall be painted to match surrounding surfaces. Elements installed in locations not visible by building occupants do not require painting. Ideally, all elements of the horizontal and riser pathway systems will be completely hidden from view. However, if this is not possible, the designer shall carefully determine routing and components used to minimize negative aesthetics impacts. Historically, false columns, soffits, and archways have been constructed to conceal wireways and conduits in especially sensitive areas of buildings. These structures shall be installed in a manner consistent with the visual architecture of the building, while still allowing access for installation of cabling.

**END OF SECTION 27 0536**

**SECTION 27 0553**  
**IDENTIFICATION FOR COMMUNICATION SYSTEMS**

**PART 1 GENERAL**

**1.1 REQUIREMENTS**

- A. This section describes labeling requirements for communications systems. Labeling is a critical requirement and shall be attended to in detail.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. The materials used for this system are to be manufacturer and part number specific with no substitutions, unless specified as accepting "or equal." See Design and Construction Guidelines – Division 27 - Communications for a list of materials acceptable for use in North Carolina State University projects.

1. [https://facilities.ofa.ncsu.edu/files/2015/02/division27\\_communications.pdf](https://facilities.ofa.ncsu.edu/files/2015/02/division27_communications.pdf)

**END OF SECTION 27 0553**

**SECTION 28 3100  
FIRE DETECTION AND ALARM**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.

**1.2 SCOPE**

- A. This section of the specifications includes the furnishing of the microprocessor controlled fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, auxiliary control devices, notification devices, and accessories as shown on the drawings and specified herein.

There is an existing system to be modified on this project. All new devices shall be compatible and UL Listed for use with these systems. This specification applies in all parts that are applicable to the modification of the existing system – no exceptions.

- B. The University maintains and services all fire alarm equipment on campus.
- C. The fire alarm system shall comply with applicable provisions of the NC Building Code, NFPA 70 - National Electrical Code (NEC) and NFPA 72 -National Fire Alarm Code. The Contractor shall furnish all parts, materials, and labor customarily required or provided for a complete and operating system, in accordance with all requirements applicable, even if each needed item is not specifically shown or described in the project plans or specifications.

**1.3 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled by UL, Inc. All products, including initiating devices, shall be as produced or supplied by the same manufacture as the main fire alarm control panel. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable for use on this project.

Manufacturer's shall agree to make factory training/certification, product programs and/or operating systems, and continued product updates and/or Tech notes available to the University. Any licensing and/or proprietary agreements between the manufacture/distributor and the University must be completed and in place prior to the manufacture and/or product being acceptable for installation.

- B. Installer's Qualifications: An experienced company who is an authorized representative of the FACP manufacturer for both installation and maintenance of all equipment is required for installation of the FACP and connection of all circuits for any project. The Installer shall have a minimum of five (5) years documented experience installing fire detection and alarm systems similar in size and scope to this project. The Installer technicians shall be individually certified NICET Level 2 and by the manufacturer of the equipment and trained and certified on the specific model being installed. The Installer shall have at least one technician on staff certified NICET Level 3. Certifications shall be current to latest release and must have occurred in the most recent 24 months. All connections to the FACP, system programming, and/or programming changes shall be accomplished only by the Installer technicians compliant with qualifications, and must be present for the 100% test, Engineer's inspection, and Owner inspections.
- C. Codes and Standards: The codes and standards listed below are utilized as design criteria for "minimal" system coverage. The University may require additions to these codes and standards based on historical consensus criteria for design and installation of fire alarm systems specific to facility applications within University type settings.

1. NFPA Compliance: Comply with current applicable requirements of NFPA-72, National Fire Alarm Code.
2. NEC Compliance: Comply with current applicable requirements of NFPA-70, National Electrical Code (NEC) standards pertaining to fire alarm systems.
3. State Building Code Compliance: Comply with applicable requirements of the North Carolina State Building Code.
4. Testing Laboratory Compliance: Comply with provisions of UL safety standards pertaining to fire alarm systems. Provide products and components, which are Listed and Labeled.
5. FM Compliance: Provide fire alarm systems and accessories, which are FM approved.
6. Comply with Authority(ies) Having Jurisdiction (AHJ):
  - a) NC State code requirement issues: NC Department of Insurance/North Carolina State Construction Office.
  - b) University code requirement issues: NCSU Fire Marshall
  - d) University policy and system application requirements: NC State Facilities Operations Electronic Systems –  
[https://facilities.ofa.ncsu.edu/files/2015/02/division26\\_fire\\_alarm\\_systems.pdf](https://facilities.ofa.ncsu.edu/files/2015/02/division26_fire_alarm_systems.pdf)

#### 1.4 SUBMITTALS - GENERAL

- A. Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not comply fully with each and every requirement of the specifications, the submittal shall clearly indicate such deviations and may be subject to rejection. Identification requirements for non-complying features of items are very specific.
1. Installer Certifications:
    - a. Submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses, and telephone numbers in the certification.
    - b. Copies of manufacturer signed certifications and NICET certifications as required in section 1.3.B above.
  2. Product Data: Submit Manufacturer's technical product data, including specifications and installation instructions, for all system components (i.e, boards, devices and/or modules, duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and/or other similar items which require mechanical installation.) that will support the entire fire alarm system. Submit technical product data on any required fire alarm system servicing and/or support equipment.
  3. Maintenance Data: Submit maintenance data and parts lists for each type of fire alarm equipment being furnished, including furnished specialties and accessories. Include this data and product data in maintenance manual.
  4. Shop Drawings: Submit (2) bound, full size sets of shop drawings showing all equipment, all device/module locations, and connecting wiring of entire fire alarm system depicted on scaled architectural floor plans with Installer's border sheet. Include wiring and riser diagrams and battery calculations. See (Attachment A) for typical wiring and riser diagrams. Provide distance and proposed route for each Notification Appliance Circuits

(NAC's). Electronic copy of such plans shall also be provided by the Engineer in a format compatible with the most recent release of AutoCAD.

The fire alarm contractor shall submit complete Shop Drawings to the Engineer for review, prior to performing any work. These shall clearly demonstrate compliance with the Engineer's plans and specifications, which have a System Response Matrix showing the fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal. Any non-compliant features must be fully described.

Engineer's approval (with or without corrections) of contractor's Shop Drawings, samples, cut sheets, etc., is for general conformance with the contract documents and design concept. It shall not relieve the contractor of responsibility for full compliance with the project plans and specifications, except for any specific non-compliant features for which the engineer gives written authorization.

5. Wiring and Cabling: Submit wire and cable for signal circuits and notification circuits.
  6. Installation Instructions: Submit Manufacturer's detailed installation instruction for all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.
  7. Standby Battery Sizing Calculations:
    - a. Provide battery calculations used to size secondary power source(s). Calculations must be submitted prior to installation of equipment. Identify NAC current draws and voltage drops for each circuit in the submittal package. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.
    - b. Include a copy of system battery sizing calculations with the shop drawing submittal to the engineer. Use manufacturer's battery discharge curve to determine expected battery voltage after 24 hours of providing standby power. Then use calculated Notification Appliance Circuit current draw in the alarm mode to determine expected voltage drop at EOL, based on conductor resistance per manufacturer's data sheet or NEC
    - c. The voltage drop at EOL must not exceed 14% of the expected battery voltage, after the required standby time plus alarm time. (Typically, for a 24 volt system, this limits the voltage drop from the battery to the EOL to 3 volts). Determine "worst case" voltage at far end of each NAC, by subtracting its calculated V-drop from the expected battery voltage. The result must be no less than the minimum listed operating voltage for the alarm notification appliances used.
    - d. All of these calculations must be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians. NAC voltage drop is to be verified during system tests.
    - e. Submittal shall list voltage drop allowed for main fire alarm panel and Notification Appliance Circuits panels (NAC's). Calculations must be submitted prior to installation of equipment. Battery calculation shall be based on "worst case" scenario of current draw, voltage available after 24-hours standby and 15 minutes of full alarm, shall be indicated on a battery chart. The UL minimum voltage allowed by panel shall be used to calculate NAC current draw and voltage drop. Submittals shall provide milliamp current draw data for each device submitted and UL Listed minimum voltage required to operate.
- B. Assumption of Existing System Responsibility/Liability: Any construction project additions and/or renovations that will require changing the current programming of an existing fire alarm system in any way shall require an official transfer of the entire FACP system responsibility to that contractor. This also includes significantly impairing any active system to accommodate phased

construction projects where the FACP will either be: removed in its entirety at the completion of the project and/or significantly modified and/or totally replaced through a dual system coverage conversion type project. A signed letter transferring the responsibility of the system as well as an emergency contact list shall be provided to the owner prior to the start of any construction.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURER'S/MODELS**

A. Manufacturer's/Models: Subject to compliance with requirements in section 1.3.A above, the current manufacturer's and corresponding panel models that are acceptable to be incorporated into the contract are limited to the following:

1. Existing system is Simplex 4100ES. All components installed as part of this project shall be listed and compatible with existing system and devices.

### **2.2 AUXILIARY POWER SUPPLY PANELS (APS)**

A. APS - Minimum Requirements: Match existing.

### **2.3 ALARM NOTIFICATION APPLIANCES**

A. Audible/Visual Combination Devices: Match existing.

### **2.4 INITIATING DEVICES**

A. Addressable Type Devices – General: Match existing. All initiating devices shall be individually addressable. Addressable devices shall comply with the following requirements:

1. All addressable spot type and duct smoke detectors shall be the analog type and the alarm system shall automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors. This feature must be armed and sensitivities set prior to acceptance of the system.
2. Address Setting: Addressable devices shall provide an address-setting means.
3. Connections: Addressable devices shall be connected to a Signaling Line Circuit (SLC) with two (2) wires.
4. Operational Indications: Addressable initiation devices shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. Both LEDs shall be placed into steady illumination by the FACP to indicate that an alarm condition has been detected. The flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the device base to connect an external remote alarm LED.
5. Intelligent Initiation Devices: All smoke detectors shall be the "intelligent" in that smoke detector sensitivity shall be set through the FACP and shall be adjustable in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP on a time of day basis. Using software in the FACP, detectors shall be capable of automatically compensating for dust accumulation and other slow environmental changes that may affect performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
6. Spot-type detectors must be the plug-in type, with a separate base (not a mounting ring), to facilitate their replacement and maintenance. The base shall have integral terminal strips for circuit connections, rather than wire pigtailed. Each detector or detector base shall incorporate an LED to indicate alarm.
7. Device mounting Base: Unless otherwise specified all detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

8. **Sounder Base:** Provide bases with a built-in (local) sounder rated at 85 dBA minimum. Configure sounder bases such that sounders are activated under conditions as described in the Matrix.
  9. **Test Means:** The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel when in the "test" condition.
  10. **Device Identification:** Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device. Device identifications shall be either ION, PHOTO, or THERMAL.
- B. **Addressable Manual Stations (Pull Stations):** Match existing. Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
1. All pull stations shall be dual-action, have a positive, visual indication of operation and utilize a key type reset.
  2. **Construction:** Pull stations shall be constructed of Lexan or other material suitable to the installation environment with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger. Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans. Unless otherwise indicated on the Drawings pull stations shall be mounted at 48" Above Finished Floor.
- C. **Photoelectric Smoke Detectors:** Match existing. Photoelectric smoke detectors shall use the photoelectric (light scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. **Addressable Thermal Detectors (Heat):** Match existing. Thermal Detectors shall be intelligent addressable devices rated at 135°F. (58° C.) and shall have a rate-of-rise element rated at 15° F. (9.4° C.) per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop. Thermal detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
1. **Non-Rate of Rise Detectors:** Provide thermal detectors with non-rate of rise thermal elements. Non-rate of rise detectors are indicated by NRR adjacent to the thermal detector symbol.
  2. **Specialized Element Temperature Ratings:** Provide thermal detectors with specialized element temperature ratings. Specialized element temperatures are indicated by a temperature rating adjacent to the thermal detector symbol, e.g. 195°F.
- E. **Duct Smoke Detectors:** Match existing. Probe length shall extend the full width of the duct. Those over 36 inches long must be provided with far-end support for stability. Lengths shall be determined by Mechanical Contractor in coordination with the University. Furnish each duct detector unit with a remote alarm indicator light (RAIL) and test station. Mount remote indicator light/test station on wall at 8'-0" AFF in the nearest corridor or public area. Detectors shall be turned over to HVAC Contractor for him to install in ducts. Fire alarm AHU and fire/smoke damper shutdown relay circuits shall be wired from the fire alarm control panel to a termination point, adjacent to the AHU and fire/smoke damper control. Mechanical Contractor shall make all control wiring connections for shutdown of respective AHU and fire/smoke damper via addressable control relay(s) at termination point activated by the fire alarm control panel. Addressable control relays shall be installed within three (3) feet of the controller for the equipment being controlled.

All air handling systems and fire/smoke dampers shall be shutdown directly by the FACP during alarm shutdowns. Building automation systems shall not be used for alarm shutdowns of air handling systems.

Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.

A supervised "AHU Shutdown Defeat" switch shall be provided in/adjacent to the FACP or as a key-operated function in the Remote Annunciator (where provided). If the RA option is utilized, provide an informative engraved at the FACP about this function; otherwise provide an informative engraved label at the switch provided in/adjacent to the FACP. The switch shall cause a system "trouble" indication when the switch is placed in the off-normal ("Shutdown Defeated") position.

Unless the AHJ requires otherwise, all duct detectors shall be programmed for fire alarm (not supervisory annunciation).

## 2.5 MONITOR AND CONTROL DEVICES

- A. Addressable Dry Contact Monitor Modules: Match existing. Addressable Monitor Modules shall be provided to connect one supervised IDC zone (either Style D or Style B) of non-addressable Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
1. Indication of Operation: An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
  2. Mounting Requirements: Monitor Modules shall mount in a standard 4-inch square, 2-1/8" deep electrical boxes. Modules must be located in conditioned spaces unless they are tested, listed and marked for continuous duty across the range of temperatures and humidities expected at their installed location.
  3. Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler switch.
- B. Addressable Control Modules: Control Relay Device: Addressable relay module with contacts rated for 120vac, 20 amps (or add an auxiliary relay with contacts so rated). Addressable control relays shall be installed within three (3) feet of the controller for the equipment being controlled. Devices shall have visible LED(s) on cover.
- C. Isolator Modules: Match existing.

## 2.6 MISCELLANEOUS SYSTEM ITEMS

- A. Remote Display Annunciators: Not applicable.
- B. Battery Power Supply (BPS) &/or Supplementary Notification Appliance Circuit (SNAC): These types of panels shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 15 minutes of alarm upon a normal AC power failure. Battery cabinet shall be twice the size of the batteries it will contain. NAC circuits shall not exceed 75% of maximum current load allowed.
- C. Wire:
1. Non-Power-Limited Circuits: Copper conductors with 600V rated, THHN/THWN, color coded insulation.



- a) Low Voltage Circuits: STRANDED, #18 AWG, minimum.
- b) Line Voltage Circuits: SOLID, #12 AWG, minimum.
- 2. Power Limited Circuits: NFPA70, Types FPL, FPLR, or FPLP, as recommended by the manufacturer. Data Loop wire shall be shielded pair #18 AWG, 30 pf/ft capacitance or less, unless specifically prohibited by the manufacturer and stated on the wiring submittal.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all specific system installation/termination/wiring data.
- B. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure.
- C. All addressable loop controller circuits shall be "Class A" and shall have a minimum of 20% spare addresses for future use. Loops shall be confined to one floor of coverage and shall not include any devices/modules located or serving other floor areas of coverage. Loop 1 shall be assigned to the lowest elevation level of the building. Loop numbers shall increment with elevation levels of the building floors. Device numbering starts the loop with address 001 and increments sequentially accordingly as electrically connected in the circuit to the return of the loop.
- D. The system design includes AHU and fire/smoke damper shutdown; therefore, silencing the alarm (without resetting) must not reverse them. A supervised programmable "Hot Key" for all AHU Shutdown Defeat modules will be provided in the FACP. The switch will indicate "Normal" or "Off Normal" position. In addition, a supervised Hand-Off-Auto switch(es) will be provided at the FACP for any building smoke control equipment (pressurization, smoke purge or exhaust fans).
- E. The coverage of each fire alarm loop as described in the Drawings shall be indicated on the FACP and any remote annunciator. This may be accomplished by engraved labels, framed directories, and/or graphic displays. Label tape or handwritten labels are not acceptable.
- F. The system shall be equipped with the following protective devices to prevent damage or nuisance alarms by nearby lightning strikes, stray currents, or voltage transients. The devices are to be provided by the fire alarm equipment supplier:
  - 1. On AC Input(s): A feed-through (not a shunt-type) branch circuit transient arrestor such as: EFI HWM-120, Leviton OEM-120EFI, Northern Technologies TCS-HW, Transtector ACP100BWN3, or other equivalent Listed device shall be installed. Install at panelboard and trim excess lead lengths. Wind a small coil in branch circuit conductor, within panelboard, downstream of the suppressor connection. Coil is to be about 1" diameter, 7 to 10 turns, and tie-wrapped.
- G. Wiring:
  - 1. Style 6 Circuits Required: Systems with one or more addressable sub-panels that (1) have an integral addressable loop controller, or (2) monitor multiple conventional initiation zones, shall comply with the NFPA 72 requirements for Style 6 circuits.
  - 2. All wiring shall be color coded in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

<u>Addressable Devices</u>	<u>Approved Manufacture Data</u>
Signal Line Circuit cable	Red jacket with Red(+)/Black(-)

- |   |                      |
|---|----------------------|
| Alarm Indicating Appliance Circuits   | Blue (+)/Black (-)   |
| <u>Conventional Type Devices or Circuits connected directly to the FACP or to Monitored or Controlled Addressable Devices</u> |                      |
| Initiating Circuits, General*   | Red (+)/White (-)    |
| Initiating Circuits, Smoke Detectors Only*  | Violet (+)/Gray (-)  |
| AHU Shutdown Circuits   | Yellow (+)/Brown (-) |
3. No T-taps are allowed in system wiring.
  4. No splices are allowed in the system wiring. All wiring runs shall be continuous between devices. Use terminals on devices or terminal cabinets on each floor. "Wire nuts" and crimp splices shall not be permitted. Floating terminal strips shall not be permitted.
  5. Permanent wire markers shall be used to identify all connections at the FACP and other control equipment, at power supplies, and in terminal cabinets. In addition, for wiring inside terminal cabinets, affix typed professional legend to inside of terminal cabinet doors indicating wiring diagrams, line/load direction, etc.
  6. All wiring shall be in metal raceway. All wiring and cable must be in EMT, 3/4" minimum diameter, unless indicated otherwise on the Drawings or elsewhere in the Specifications. All fire alarm system raceway, couplings, and connectors must meet the performance and installation requirements of Section 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Couplings shall be steel compression type and connectors shall be steel compression type with insulated throats. All conduits that penetrate outside walls from air conditioned space must have internal sealing (duct-seal), to prevent condensation from infiltrating humid air.
  7. The exterior of all junction boxes containing fire alarm conductors shall be painted RED; box interiors shall not be painted. Box covers for junction boxes containing fire alarm conductors shall be painted RED on both sides. All painting of junction boxes and junction box covers shall be accomplished prior to installation of the boxes to avoid possible problems with overspray.
  8. Box covers shall be labeled to indicate the circuit(s) or function of the conductors contained therein. Labels shall be neatly applied black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
  9. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG #18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACP.
  10. Acceptable cables include Atlas 228-18-1-1STP, Belden YQ28541, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. The cable jacket color shall be red, with red (+) and black (-) conductor insulation.
    - a) EXCEPTION #1: Unshielded cable, otherwise equal to the above, is permitted to be used where the manufacturer's installation instructions unequivocally require, or state a preference for, the use of unshielded cable of all systems, AWG #16 minimum.
    - b) EXCEPTION #2: In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.
  11. Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must be

- properly separated from other circuits and the enclosure must have an appropriate warning label to alert service personnel to the potential hazard.
12. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten megohms, as verified with a megger. Provide advance notice to the University of these tests.
13. The system shall be electrically supervised for open or ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre alarm trouble signal shall reappear when the panel is reset.
- H. Any circuit breaker supplying 120 VAC to any fire alarm equipment shall have a locking tab installed at the breaker. Electrical contractor shall provide breaker locks for breakers serving fire/smoke dampers.
- I. All junction and pull boxes shall be painted red prior to pulling wire unless installed in finished areas.
- J. Addressable interface modules (used to monitor all contact type initiating devices) shall be located in a conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location. With AHJ approval they may be permitted to serve as many as three (3) sprinkler system valve supervisory switches, or six (6) heat detectors, in a single space.
- K. No isolation modules, relay modules, interface modules, terminal cabinets, etc. shall be located above drop ceilings.
- L. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors shall be replaced at the contractor's expense. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and shall not be used for that purpose. These covers are suitable only during final, minor clean-up or touchup operations.
- M. Mechanical Contractors shall include two (2) relocations per duct detector specified on drawings to assure working placement in ducts. Coordinate with Mechanical Contractor and University.
- N. Spare Parts Requirements:  
Provide the following spare parts with the system, each individually packaged and labeled:
- |                                  |  |
|----------------------------------|--|
| Smoke Detectors                  | Minimum of one (1) or 6% of installed quantity |
| Smoke Detector bases             | Minimum of one (1) or 2% of installed quantity |
| Duct Smoke Detectors             | Minimum of one (1) or 4% of installed quantity |
| Monitor/Relay Modules            | Minimum of one (1) or 4% of installed quantity |
| Audio-Visual Devices (Each Type) | Minimum of one (1) or 4% of installed quantity |
- Note: Increase decimal quantities of spare parts to the next higher whole number. For example if a system has 20 spot-type smoke detectors provide 2 spare detectors with bases.
- O. All intelligent fire alarm systems shall be zoned. Systems shall be zoned first by floor, then by wing (N,S,E,W), if applicable. System shall also be zoned at any fire partitions or identifiable building features. System devices shall be zoned by type (i.e. smoke detectors, pull stations, heat detectors, duct detectors, sprinkler system monitoring components, etc. shall be on separate zones). Combining separate types of devices on the same zone is prohibited. Any LED type

annunciators shall have separate zone lights for alarm (red) and trouble (amber). All supervisory LEDs shall be amber in color.

### **3.2 AUXILIARY POWER SUPPLY PANELS (APS)**

- A. General Installation: In addition to the requirements covered previously, in this specification, auxiliary power supplies shall comply with the following requirements with regard to installation, configuration, application, and operation:
1. Each APS utilized in the system shall be supervised individually by the FACP. This may be accomplished by:
    - a) On board means of setting the FACP assigned address.
    - b) Utilization of a system addressable monitor type module.
  2. Specific items of supervision include: AC power failure, battery fault, ground fault, and individual output circuit faults.

### **3.3 ALARM NOTIFICATION APPLIANCES**

- A. New and Existing to Remain locations. Both audible and visible alarm signals shall be provided. Visible signals must be the strobe (flash discharge) type, with white or clear lens, and shall comply with current ADA requirements for intensity and placement.
- B. The coverage of each fire alarm zone as described in the Drawings shall be indicated on the FACP and any remote annunciator. This may be accomplished by engraved labels, framed directories, and/or graphic displays. Label tape or handwritten labels are not acceptable.
- C. Alarm notification appliance (NAC) circuits shall be NFPA 72 Style Y (Class B). The load connected to each circuit must not exceed 80% of rated module output and the coverage of each circuit shall not exceed 3 floors (to limit the effect of faults, and to facilitate trouble-shooting). The NAC voltage drop during alarm must not exceed 14% of the voltage measured across the batteries at that time. To achieve this, the design must consider wire size, length of circuit, device load, inherent voltage loss within the FACP 's power supply, etc. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly. (Incorrect Notification Appliance Circuit performance is a frequent cause of expensive, time-consuming rework being required on fire alarm systems to obtain AHJ acceptance.)
- D. End of Line (EOL) resistors: The end of line resistors shall be installed in accessible terminal cabinets or dedicated accessible boxes, to facilitate testing and maintenance. End of line resistors shall not be mounted more than 8 feet above finished floor.

### **3.4 ADDRESSABLE INTERFACE MODULES (CONTROL AND MONITOR MODULES)**

- A. Addressable interface modules (used to monitor all contact type initiating devices) must be located in conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.
- B. One module can serve as many as 3 sprinkler system valve supervisory switches in a single space; otherwise provide one module per switch.
- C. One module may serve as many as 6 heat detectors, in a single space.
- D. Sprinkler system supervisory circuits for monitoring valve position, air pressure, water temperature, pump status, etc., must cause distinct audible and visible indications at the FACP. The audible supervisory signal shall either be a 4" diameter bell or a pulsing piezo-electric alarm. Provide the following engraved label adjacent to the bell/alarm: "SPRINKLER STATUS ABNORMAL". If only valve position is supervised, provide an engraved label reading: "SPRINKLER VALVE CLOSED".

### **3.5 DETECTORS**

- A. Install smoke detectors in interior exit access corridors, M/E rooms, computer rooms, and other spaces as shown on the drawings.

- B. Detectors used for elevator: Primary and/or alternate recall points shall be indicated on the control Matrix. Elevator capture or control signals shall come from the FACP as relayed by control modules.
- C. The FACP and all other control equipment locations, including any transponders, sub-panels, and booster power supplies, must be protected by a spot type smoke detector located within 15 feet of the equipment (measured horizontally).
- D. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator Light (RAIL) equipped.
- E. Spot-type smoke detectors shall have a built-in locking device to secure the head to the base, for tamper resistance. For detectors mounted within 12 feet of the floor, activate this lock after the system has been inspected and given final acceptance.
- F. Spot-type smoke detectors shall not be used where ceiling height exceeds 25 feet because it makes access for maintenance very difficult and could impede response.
- G. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced.
  - 1. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.
- H. A detector installed where accidental damage or deliberate abuse is expected shall be provided with a guard that is listed for use with it and is acceptable to the AHJ.
- I. Identification of individual detectors is required. Assign each a unique number as follows, in sequence starting at the FACP: (Addressable Loop # -- Device #). Show on the as-built plans and also permanently mount on each detector's base so that it's readable standing on the floor below without having to remove the smoke detector. Exception: For detectors with housings (i.e., air duct, projected beam, air sampling, flame), apply the identification to a suitable location on exterior of their housing. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
- J. Set spot-type smoke detector sensitivity to normal/ medium, unless directed otherwise by the design engineer or owner's representative. Make additional changes as directed during testing and certification of the system.
- K. Unless suitably protected against dust, paint, etc., detectors shall not be installed until the final construction clean up has been completed. Contaminated detectors must be REPLACED by the Contractor at no additional cost to the Owner.

### **3.6 DUCT MOUNTED SMOKE DETECTORS**

- A. All air duct/plenum detectors must have a Remote Alarm Indicator Lamp (RAIL) installed in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. Duct smoke detectors are permitted to be installed only inside an air duct. It is not appropriate to mount them in front of a return air opening. Duct detectors shall also be installed in a manner that provides suitable, convenient access for required periodic cleaning and calibration.
- B. Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.
- C. Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with far end support for stability.

1. The preferred method for providing support is to extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall, and plug the end with a rubber stopper. This facilitates visual inspection, intake tube cleaning, and injection of smoke or equivalent aerosol for testing the detector
- D. Duct smoke detector mounting position and air sampling tube orientation, are critical for proper operation. The Manufacturer's detailed installation instructions must be followed. The contractor shall mark the direction of air flow on the duct at each duct detector location.
- E. Unless the AHJ requires otherwise, all duct smoke detectors shall be programmed for supervisory annunciation.

### **3.7 AIR HANDLER UNIT (AHU) SHUTDOWN**

- A. A supervised "AHU Shutdown Defeat" switch shall be provided in/adjacent to the FACP. The switch must cause a system "trouble" indication when it's placed in the off-normal ("Shutdown Defeated") position.
  1. This is to provide the owner with a convenient means to temporarily resume HVAC operation in the event an unwanted alarm will not clear, prior to arrival of the fire alarm service technician.
- B. If the system includes AHU shutdown or smoke removal startup, silencing the alarm (without resetting) must not reverse the shutdown. A supervised "AHU Shutdown Defeat" switch must be provided in the FACP. The switch must be labeled and its "Normal" position indicated. Provide supervised Hand Off Auto switch(es) at the FACP for any building smoke control equipment (pressurization or exhaust fans).
- C. If the building has smoke control system fans (pressurization or exhaust), or smoke purge fans, provide Hand-Auto-Off switch(es) in or adjacent to FACP. They must be clearly labeled, and FACP-monitored or provided with status indicator lights.
  1. This shall be provided by the controls contractor, rather than the fire alarm contractor, and does not need to be part of the fire alarm system. For three-position toggle switches: 'HAND' (Manual Run) shall be "up" and have an amber LED; 'AUTO' shall be center position with a green LED; 'OFF' shall be down and have a red LED.

### **3.8 ALARM VERIFICATION FOR SMOKE DETECTORS**

- A. The fire alarm system shall be equipped with Alarm Verification.
- B. System shall provide as a feature an alternate signal processing algorithm to verify the presence of smoke. The algorithm shall be selectable during system programming. The total effective delay created by the verification algorithm shall not exceed 60 seconds.

## **PART 4 SYSTEM TESTING & CERTIFICATION**

### **4.1 Contractor/Installer Testing and Certification**

- A. Database and Drawing Inspection: The Contractor/Installer must 100% test all site-specific software functions for the system and provide a written test report or detailed check list. This documentation must include a system operation matrix showing the actual FACP response for each initiating device input. Drawings shall be verified for accurate device locations and system addresses.
  1. The complete final configuration database (site-specific programming) for the system must be permanently stored on a CD or thumb/jump drive and archived by the manufacturer or authorized distributor. A disk or CD copy of that database must also be provided to the Owner when the system is commissioned.
  2. The Manufacturer or authorized distributor must maintain software version (VER) records on the system installed. The system software shall be upgraded free of charge if a new VER is released

for any reason during the warranty period. For any new VER to correct problems, free upgrade shall apply during the entire life of the system.

- B. Contractor/Installer Field Testing: Upon completion of the installation the Division 26 Contractor and the Manufacturer's authorized representative together shall 100% test each and every *new* alarm initiating device for proper response and annunciation, every *new* alarm signaling appliance for effectiveness, and all other *new* functions such as elevator capture, control of smoke doors/dampers, proper operation of HVAC systems, and pressurization fans. ALL *new* supervised circuits must also be tested to verify proper supervision. *In addition, the complete system shall be tested as required per NFPA 72 for "Reacceptance Testing".* All site-specific software shall be tested and verified by contractor. (Control circuits and remote annunciation lines are among those required to be supervised.) The documentation shall be part of the programming reports. The contractor shall keep history of all deficiencies determined. All deficiencies shall be corrected and retested. Once this has been accomplished, the contractor shall submit to the Engineer all documentation of all problems and corrections and request the Engineer to inspect and test the system.
1. In occupied facilities all Audio Visual device tests shall be scheduled with the Owner.
- C. Upon successful completion of the Pre-final Inspection and correction of all deficiencies, the manufacturer's authorized representative shall issue a test report to: the Engineer and NC State Facilities Operations Electronic Systems detailing and certifying the test, including those requirements as specified in this document.

#### **4.2 ENGINEER Testing and Certification**

- A. Engineer System Inspection: In an effort to expedite the inspection process for projects already seriously behind schedule, the Engineer can request NC State Construction Management to schedule the NC State Facilities Operations Electronic Systems acceptance commissioning field inspection and test to be performed in conjunction with the Engineer inspection. This is not recommended and has proven to produce lengthy punch-lists and numerous re-inspections by the Owner.

See Attachment B for Addressable System Checklist

- B. Once the Engineer has inspected, tested and is satisfied the system is 100% operational, and has met all aspects of the Engineer design, the Engineer shall notify NC State Construction Management to schedule the NC State Facilities Operations Electronic Systems owner acceptance commissioning inspection and test. At that time the Contractor and Engineer shall also and submit the following:
- The latest copy of Detector Sensitivity Report.
  - A printout of the current installed site-specific database.
  - Signed NFPA "Record of Completion" form per NFPA 72.
  - Current copy of as-built drawings with correct room numbers and device system addresses. Room numbers must be installed.
  - Copy of battery calculations.
  - Copy of record for the Signal Line Circuit voltage measurements taken at the EOL devices during the Engineer test. Take readings at the start of the test and every 15 minutes during NAC test. Test shall be 30 minutes minimum. Test shall be conducted with AC power off and under battery power only.

#### **4.3 Owner Testing and Inspection**

- A. Database and Drawing Inspection: The NC State Facilities Operations Electronic Systems will require all the above and a minimum of five (5) days for review of the system database and drawing review, prior to scheduling any on-site test.

1. Upon completion of the system database and drawing review any discrepancies will be documented and forwarded to NC State Construction Management requiring action and corrections from the Contractor's system installer/programmer. When the required actions and corrections have been addressed and performed a corrected printout of the installed site-specific database and drawings shall be forwarded to the Life Safety Shop for re-review. After review and satisfaction that the corrections have been made, then and only then, will the NC State Facilities Operations Electronic Systems schedule their field inspection and test. The NC State Facilities Operations Electronic Systems will notify NC State Construction Management of the scheduled date and time.
- B. Owner acceptance commissioning field inspection: A 100% fully functional test of all aspects of the system will be conducted. Therefore, it is expected that the system shall be complete in all aspects. Each function and aspect of system will be tested along with each and every initiating device. Also, all other system functions shall be verified, including but not limited to (where applicable): elevator capture features, control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, sprinkler systems, etc. The trades' personnel representing the various aspects must be present. The Engineer representative does not have to attend but may attend if so desired. The fire alarm vendor's technician who programmed the system shall be present.

NOTE: If at any time, during the owner's acceptance commissioning field inspection and test, it appears that the installation contractor has not performed a prior 100% performance test, the current test will be terminated and rescheduled.

1. Upon completion of the acceptance commissioning field inspection and test, the NC State Facilities Operations Electronic Systems will forward a list of discrepancies in the form of a formal "Punch List" to NC State Construction Management for comment and/or inclusion in the Engineer's punch-list of items requiring action and/or corrections from the effected systems contractors/installers. Once the contractors/installers have corrected these items, the Engineer shall notify NC State Construction Management and schedule a re-inspection by the NC State Facilities Operations Electronic Systems. When the systems are verified to be satisfactory by the NC State Facilities Operations Electronic Systems, the Engineer shall be notified by NC State Construction Management to schedule an inspection and test with the Office of State Construction. On or before the day of the Office of State Construction the following shall be completed and/or provided to the Owner:
  - Copy of current database installed in the system on digital thumb/jump drive.
  - All drawings shall be posted.
  - All spare parts and test equipment as described in the specification shall be turned over to the owner.
  - All training requirements shall be met or scheduled.
  - All required software on CD or digital thumb/jump shall be turned over to the owner.
  - All certifications.
  - A new signed and dated NFPA "Record of Completion" form per NFPA 72.

#### **4.4 System Acceptance**

- A. Office of State Construction inspection: The above items shall be completed before the Office of State Construction inspection. Upon completion of Office of State Construction inspection any items or discrepancies must be corrected. When this obligation has been met the warranty shall begin on the day the Engineer notifies the Office of State Construction and the NC State Facilities Operations Electronic Systems to that effect.
1. Beneficial or partial occupancy acceptations shall require the system contractor/installer to remain responsible for the "live" system. A daytime and after hours contact list shall



be provided to the NC State Facilities Operations Electronic Systems which will include the names and phone numbers for three (3) responsible individuals until Final acceptance has been granted.

- B. The contractor shall notify the supervisor of the NC State Facilities Operations Electronic Systems prior to performing any work on the system after the final acceptance by the Office of State Construction.

## **PART 5 SYSTEM DOCUMENTATION, TRAINING, & MAINTENANCE**

### **5.1 System Documentation**

- A. The Contractor/Installer shall provide the Engineer: with three (3) copies of the following:
1. As-Built Drawings: Submit bound full size sets of scaled architectural as-built floor plans depicting final device/module and equipment locations with corresponding system addresses, all circuiting, and pathways, and terminal cabinet locations, including wire color code and/or label numbers, and showing all interconnections in the system. Include wiring and riser diagrams with actual field measured battery calculations for the main fire alarm panel and all individual circuits of the Notification Appliance Circuit panels (NAC's). In addition provide an electronic copy on CD in format compatible with the most recent release of AutoCad.
  2. Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, etc.
  3. Technical literature on all major parts of the system, including control panels, batteries, detectors, manual stations, alarm indicating appliances, power supplies, and remote alarm transmission means.
- B. The Contractor/Installer shall provide the Owner: with the following:
1. A current factory approved certification/ training schedule for the specific system installed.
  2. As-Built Drawings: Submit (1) bound full size set, and (1) one 11"x17" set, and an electronic copy in format compatible with the most recent release of AutoCad, of scaled architectural floor plans depicting final device/module and equipment locations with corresponding system addresses, all circuiting, and pathways, and terminal cabinet locations. Include wiring and riser diagrams with actual field measured battery calculations for the main fire alarm panel and all individual circuits of the Notification Appliance Circuit panels (NAC's).
    - a) Electrical and Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, riser panels, etc.
  3. Three (3) copies of all software required, both for the installed fire alarm system and for any personal computer (PC) necessary to access the fire alarm system for trouble shooting, programming, modifications, monitoring, de-bugging, or similar functions.
  4. Three (3) copies of the complete maintenance, installation, and programming manuals for the installed fire alarm system. If available an electronic version is desired and acceptable. Also provide all technical literature on all major parts of the system, including control panels, batteries, detectors, manual stations, alarm indicating appliances, power supplies, and remote alarm transmission means.
  5. Three (3) of each interconnection cables that are required to connect the fire alarm system to a PC.
- C. The Equipment Manufacturer's shall provide the Owner: with the following:

1. Agreement to License and/or factory certification system training for the NC State Facilities Operations Electronic Systems technicians to maintain and service the equipment installed under this contract.
2. Direct access and support for the NC State Facilities Operations Electronic Systems Shop technicians from the Manufacturer's or Factory's Technical Services.

## 5.2 System Training and Maintenance

- A. During the design specification review process, the Design Manager and the NC State Facilities Operations Electronic Systems will jointly review the proposed specifications to determine if training is required for the proposed life safety system. Training requirements, scheduling, and purchasing of computers will be coordinated by the NC State Facilities Operations Electronic Systems directly with the installation equipment Contractor/Installer and the equipment Vendor/Factory. All cost involved with training travel (transportation, accommodations, meals, etc.) will not be assessed to the Contractor/Installer as part of the contract, but will be funded separately by NC State from allocated reserves.
- B. The Equipment Manufacturer's shall provide the Contractor/Installer and/or the Owner: with the following:
1. The schedule of available dates when classes are available to obtain License and/or factory certification system training for the NC State Facilities Operations Electronic Systems technicians to maintain and service the equipment installed under this contract.
  2. Training Content: Factory/Manufacture classes, training and testing shall provide what is necessary to certify and/or authorize attendees to program and service the fire alarm system installed for this project, including system hardware and software. Additionally, the training shall cover the following topics as a minimum:
    - a) Preventative maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
    - b) Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to add or delete devices to the system and to take any device out of service and return any device to service without need for Manufacturers approval.
    - c) Explanation of all control functions, including training to program and operate the system software.
    - d) Manuals, drawings, and technical documentation.
    - e) The actual system software used to support the fire alarm system installed for this project shall be provided on jump drive, and any required "software keys" to successfully operate the software on the technicians computers shall be provided to the Owner's technicians upon successful completion of the training.
- C. The Contractor/Installer shall provide the Owner: with the following:
1. The contractor shall submit a complete site specific system orientation training schedule including dates, times and location for approval by the Owner and Engineer, which shall include:
    - a) Preventative maintenance and any special servicing and/or maintenance techniques, including methods and means of troubleshooting and replacement of all field wiring and devices and, methods and procedures used for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry and interconnections.
    - b) Overall system concepts, capabilities, and functions.

- c) Explanation of all control functions, input or output.
  - d) Any device and/or equipment locations that are not easily found.
  - e) Any programming peculiarities that is inherent in the system.
2. The Contractor/Installer is responsible for ensuring that the manufacturer's authorized representative shall provide a schedule of the available manufacture certification training for attendance by the Owner's designated employees. The training will include the proper programming procedures, operation of the system, troubleshooting and maintenance aspects, and all required periodic maintenance.
- a) The authorized representative will coordinate training arrangements with the Owner's schedule.
  - b) Location: On-site certification training is preferred and NC State will make available classroom space as needed by the manufacturer. If travel is required, the NC State Facilities Operations Electronic Systems will determine the personnel required to be trained.
3. The Contractor/Installer is responsible for ensuring the manufacturer provides the Owner with the following:
- a) Licenses and/or certifications to maintain and service the equipment installed under this contract.
  - b) Direct access and support for the University Technicians to the Manufacturers Technical Services.
4. Equipment: The Contractor/Installer is responsible for providing a list of all required support equipment necessary to support the fire alarm system installed for this project. This list shall include computers (laptop or desktop), software, connecting cables, accessories and auxiliary equipment necessary to effectively operate the life safety system.

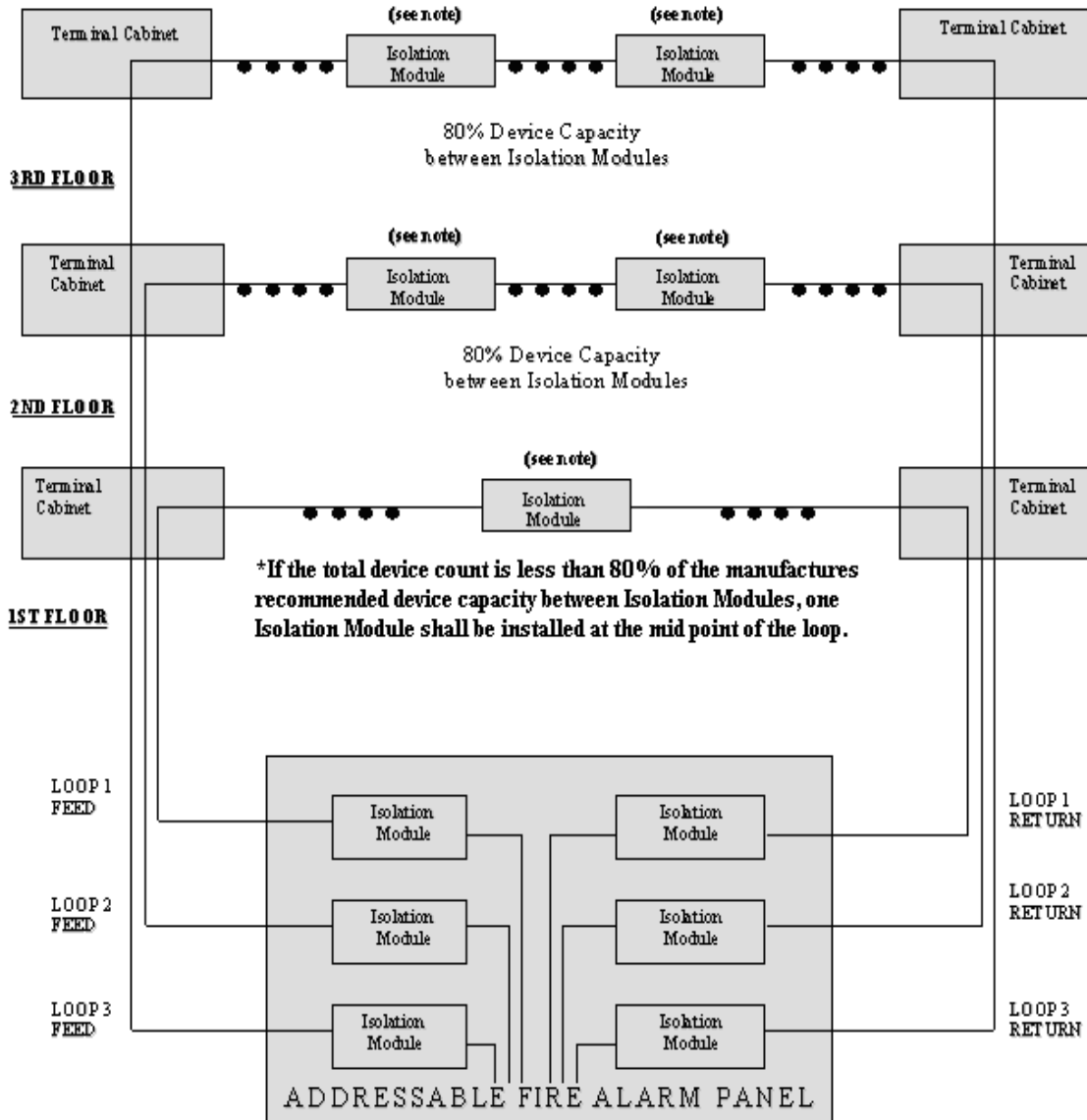
### 5.3 WARRANTY

- A. This warranty coverage shall include parts for one (1) year.

Attachment A:

**REQUIREMENTS FOR FIRE DETECTION AND ALARM SYSTEMS**

**Typical Addressable Fire Alarm System Riser in Large, Multi-story Buildings**



**\*NOTE:** Isolation modules mounted outside terminal cabinets shall be mounted per the same specifications and guidelines described by NCDOT for audio/visual devices.

Attachment B:

# FIRE ALARM SYSTEM CHECK LIST



BUILDING NAME: \_\_\_\_\_ LOCATION: \_\_\_\_\_

DESIGNER: \_\_\_\_\_ INSTALLER: \_\_\_\_\_

INSPECTION BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## Preparation for Acceptance Test

- Fire authorities have been notified of the system test. Also notify any location where alarms are transmitted. **DO NOT ROLL FIRE TRUCKS BY ACCIDENT.** All building occupants have been clearly notified of the system test.

## All required documents are on site for the SCO inspection and review.

- A copy of the project plans and specification
- A copy of the contractor's approved shop drawings including:
  - cut sheets
  - battery size calcs
  - Matrix
  - plans
  - Voltage drop calcs
  - Training Certificates
- A copy of the Fire Alarm system "as built" drawings showing the routing of circuits installed
- Final NFPA 72 "Fire Alarm System Record of Completion" form
- A copy of the System Operation Matrix, giving the FACU response for each initiating device input, has been provided by the fire alarm installer to facilitate testing.
- A copy of the sensitivity report
- A copy of the printout generated by the 100% device testing

## NFPA 72 "Record of Completion"

- NFPA 72 "Record of Completion" Form, filled out, with all signatures and at FACU**
- Appropriate year of form is used per year of Building Code permit
- Appropriate chapters must be indicated (see chapter list in the reference section of document)
- The manufacturer's authorized distributor (by definition the "installer") who made final connections at the FACU and programmed the system gave the owner and AHJ advance notice of the required 100% operational tests, so they could elect to attend.  
NOTE: The required 100% testing cannot properly be done by a single technician without a helper, even if the FACU has Walk-Test or an equivalent feature. Query the tech on how testing was performed.
- Signatures on the form must match the typed/printed names and each section must be complete. Do not accept a company name in place of the responsible individual. The individual must have a certificate. NOTE: If part or all of the testing was witnessed by a representative of the AHJ, the final line of the form is signed to indicate that. (SCO design contracts give that responsibility to the electrical PE.)
- Verify the technician who programmed the alarm system was trained and certified by the manufacturer, for the specific FACU model being installed, within the past 2 years. (A copy of the cert. should have been submitted with the Shop Drawings.) NICET Level III certification will extend this to 36 months.

## REVIEW THE FOLLOWING ITEMS FROM THE SHOP DRAWING SUBMITTAL:

- Contractor has submitted battery calculations to the designer, verifying the system meets applicable capacity requirement of NFPA 72. The minimum endurance is 24 hours plus 5 minutes of alarm load. See the specification for additional requirements imposed by the AHJ.
- Battery sizing calculations verifying adequate Amp-Hour rating, indicating that the worst case NAC voltage on battery is within alarm notification appliance listing, and that NAC alarm load voltage drop at EOL does not exceed **14%** of battery voltage.
- Notification Appliance Circuit (NAC) calculated current draw, demonstrating that none exceed 80% of rated module output.
- If system is the Emergency Voice/Alarm type, amplifier load calculations.
- Copy of factory training certificates for technicians who programmed the system.

## REVIEW THE FOLLOWING ITEMS FROM 100% Test:

- System Status and Programming Report, which includes the following 3 elements:**
  - Program settings for each alarm initiating device
  - Current sensitivity reading of each smoke detector
  - System operational matrix, giving response for each alarm input

- If building has smoke purge system, an HVAC balance report in purge mode**
- Two bound copies of the following information on the system (may be combined):**
  - Manufacturer's technical literature (cut sheets) on system components
  - Required maintenance schedule on system, to comply with NFPA 72
  - As-built drawings with loop #'s, device addresses, equipment terminals

**COMPARE DOCUMENTS TO INSTALLATION**

Shop drawings calcs:	NFPA 72 says:	Installed size is:
FACU batteries ___Ahr___@___V each	___Ahr___@___V each	___Ahr___@___V each
NAC batteries ___Ahr___@___V each	___Ahr___@___V each	___Ahr___@___V each
DACT batteries ___Ahr___@___V each	___Ahr___@___V each	___Ahr___@___V each
SLC loops _____class_____	_____class_____	_____class_____
NAC Circuits _____class_____	_____class_____	_____class_____

**Check Fire Alarm Control Panel(s)**

- VERIFY SYSTEM IS IN TEST MODE AND THE FIRE TRUCKS WILL NOT ROLL.**
- Operating instruction summary is framed and mounted at (or inside) the FACU.
- Green grounding wire is bonded to FACU cabinet, and also connected to designated terminal on motherboard (if any).
- AC Power
  - o Branch circuit to FACU does not share conduit with 24vdc alarm initiating circuits or notification appliance circuits.
  - o Circuit breaker(s) serving FACU (and associated equipment) have lock on clips and red dot at breakers. (Some electricians will not paint the handle to avoid damage to the breaker)
  - o Placard inside FACU gives the following info on this circuit: **Panelboard location, panelboard identification, and branch circuit number** (The same applies to SNAC panels and any other system control equipment)
  - o Surge arrestor model listed in project spec (feed-through type with "pi" configuration) is installed at electrical panelboard, on the 120vac branch circuit to FACU. Arrestor leads are trimmed as short as practical. See attached wiring diagram for more info.
- Fire alarm control unit (FACU) is powered up and clear of alarms, supervisory signals, and trouble conditions.
- Have ground fault put on any alarm initiating or notification appliance (horn-strobe) circuit. FACU must indicate "ground" and general "trouble." Verify this ordinary "trouble" signal is not sent to any Remote Supervising Station.
- Record battery size and verify date of installation is marked on each battery (Marking of the date of manufacture of the battery is a code requirement – so you will find 2 dates)
- Have technician disconnect a battery lead and verify the FACU indicates a local trouble signal within one minute of that action.
- Reconnect battery, **then** turn off 120vac. Batteries should measure approx. 13 volts, and differ  $\leq 0.4$  volt. (Also check batteries in any booster power supplies.)
- If system is connected to Remote Supervising Station, verify the FACU did **not** transmit AC Power Failure "trouble" signal, as it was not maintained for 1-3 hours.
- Have technician confirm FACU is programmed to send an AC power failure trouble signal to Remote Supervising Station if power loss continues for 1 hour minimum to 3 hours maximum. Also, verify that no other types of "trouble" signals are reported.



- The FACU and any transponders, sub-panels, DACT and "ADA" booster power supplies must be protected by a smoke detector within 15 feet of their location, measured horizontally, as required by Code (NFPA 72).
- Addressable loop controller circuits are Class "A", with isolation modules at FACU on the outgoing and return loop, after each 25 addressable devices (max) on the loop, and (if  $\leq 25$  devices) at midpoint.
  - Have the technician apply a short circuit on the SLC loop. This will force two isolation modules to clamp. The test is to verify their operation and device count between the two that clamp.
  - With AC power off, there will be multiple troubles on the system. The total count will increase during this test. Exclude the count prior to the short.
  - On retrofit and repair work where the AHJ has approved the use of a class B SLC wiring design the isolation modules will not be installed.
  - Verify the number of devices between Isolation modules meets the specification requirement.
- While on battery power, initiate Alarm. Batteries should remain at 12+ volts each, but dropping slowly. Let alarm continue during next step.
- Verify the Notification Appliance Circuit (NAC) voltage drop at the EOL is  $\leq 3$  volts. Do this separately for each NAC. Look at the shop drawing to find the worst case scenarios when spot checking at a final.
- Silence the alarm and verify that any Remote Supervising Station has received a fire alarm signal. Reset the FACU and verify the Station receives a subsequent "restore" signal, indicating the alarm condition has been cleared.
- Verify requirements on wire type and gauge were followed and that the color code for circuits is proper throughout the system. (Review specifications and shop drawing requirements.)
- Have installing technician demonstrate that the system is programmed so all **spot-type** smoke detectors have automatic drift compensation and FACU will indicate when prescribed sensitivity limits are reached or exceeded.
- If system has provisions for "alarm verification" algorithm, arm it only if needed for the environment. Do **not** apply it to multi-sensor or multi-criteria smoke detectors.
- If any addressable control relays are installed, verify their contact ratings are suitable for connected load. (Some are rated for resistive loads only.) Also, if they require separate 24vdc power for operation, verify the circuit is electrically supervised. Compare their installed location to the design intent.
- All field wiring in the system has wire markers where landed at the FACU, and also in the terminal cabinet(s) on each floor of multistory buildings.
- If system uses an LED "zone" annunciator to provide a quick visual overview of the fire scenario for responding public safety personnel (general fire area and type of alarms), a framed directory or typed/engraved LED labels provide clear information on "zone" (area) boundaries and the type(s) of alarms (i.e., smoke, waterflow, etc.)
- During the walk through of the site verify that there are **no** splices in the system wiring other than at terminal blocks which are installed in identified terminal cabinets. "Wire nuts" and butt splices are not permitted on new work.
- All circuits are properly and securely terminated. Approved terminal fittings are used for any stranded wire terminations at screw posts that lack pressure connectors.

- Initiate alarm on a representative sample of devices by operating manual fire alarm box, blowing smoke into detector, flowing water from sprinkler system inspector's test station, etc., except do not test any non-restorable, fixed temperature heat detector. (get total counts from 72 form)
  - Photo smoke \_\_\_\_/\_\_\_\_
  - Ionization smoke \_\_\_\_/\_\_\_\_
  - Pull Station \_\_\_\_/\_\_\_\_
  - Duct smoke \_\_\_\_/\_\_\_\_
  - Other detector \_\_\_\_/\_\_\_\_
  - tamper switch \_\_\_\_/\_\_\_\_
  - Heat detector \_\_\_\_/\_\_\_\_
  - Flow switch \_\_\_\_/\_\_\_\_
  - \_\_\_\_\_/\_\_\_\_
- For each device tested have FACU operator read out the FACU display and the LED display. (Radios are very helpful at this point.) There should be a clear indication of device type, device number and location for each device tested.
  - Individual detectors of all types shall be identified on their bases (Loop # -- Device #), in sequence on the loop from the FACU
- While spot testing devices in the facility verify operation of audible-visible alarm notification appliances.
  - Audible alarm devices must be 15 dBA above normal ambient sound level in all occupiable areas of building. (Use meter if in doubt.)
  - Indoor strobes must flash 60-120 times/minute and those installed in a single space (room, corridor, etc.) must be synchronized and remain synchronized throughout the test.
- Also verify HVAC shutdown and closure of (any) smoke doors. These functions must be done by the FACU, rather than by integral smoke detector relay contacts.
  - Shutdown must occur within 20 seconds, except gas pack units can be arranged for up to 60 seconds delay before the fan stops, to prevent heat exchanger damage.
  - After verifying the HVAC shutdown is operational it is acceptable to activate the HVAC bypass to avoid excessive restarting of large air handler systems.

#### **ELEVATORS**

- Elevator control key and technician must be on site for the following tests to take place
- Elevator lobby detectors must be within 21 feet of each elevator door
- Test detector(s) located at elevator lobby that will initiate elevator recall
  - Verify recall to a primary floor
  - Verify recall to alternate floor
  - Verify illumination of "Fire Hat"
- Test detector(s) located in shaft & elevator machine room
  - Verify recall to designated floor
  - Verify flashing illumination of "Fire Hat"
- Heat Detectors installed in a shaft or machine room and used for shunt trip activation shall be located within 2 feet of each sprinkler head. (Verify heat setting is less than sprinkler setting per code req.)

#### **SPRINKLER SYSTEMS**

- If a sprinkler system is present, check the operation of the waterflow alarm switches by flowing water from Inspectors Test connection(s), unless dry pipe system. Alarm sounds in 20-45 seconds and any outside water motor gong rings properly in  $\leq 300$  seconds.
- Inspectors Test Connection flow is limited to 1/2" stream (or actual orifice size of the sprinklers in the system, if different) by a valve or sight glass marked accordingly, or by a sprinkler head (minus deflector) mounted at discharge. NOTE: If a pipe union with an internal restrictor plate is used for this purpose, have the sprinkler contractor take at least one apart for inspection, to verify the orifice size.
- Close any electrically supervised sprinkler control valves to verify supervisory alarm at FACU within 2 turns of control wheel or, for Post Indicator Valve (PIV), within 1/5 of valve control mechanism's travel distance. Then reopen to verify "restore" signal.
- If dry pipe or pre-action sprinkler system, have contractor demonstrate waterflow alarm functions, and that both high and low air pressure are supervised as required.
- Each fire extinguishing system, such as in a kitchen hood, is connected to give building fire alarm. Have contractor demonstrate that this functions properly, by manually operating the monitored switch, without releasing extinguishing agent.

NOTE: Kitchen hood fire extinguishing system activation must shut off the gas, if used, and, for wet chemical type, also operate a shunt trip breaker to shut off the electric power to all protected appliances under the hood. The exhaust fan(s) keep running but the make-up air must shut down. These functions are to be done directly by fire extinguishing system, rather than the FACU, since it is not appropriate to cut off the gas supply or to operate the shunt trip for other types of alarms not involving the kitchen hood extinguishing system (e.g., smoke detectors, fire alarm boxes, etc.).

- Verify that fire alarm system monitors power to any fire suppression system shunt trip breakers. (Look for kitchen hood systems and sprinklered elevator spaces.)
- If remote alarm annunciator in building, verify proper operation, including the audible "Trouble" signal. Check its "Lamp Test" and "Trouble Silence" features, if provided.
- If a Fire Pump is part of the sprinkler system – verify that NFPA 20 certification was provided and testing has been successfully completed

#### **OTHER SUPPRESSION SYSTEMS**

- Pre-action suppression system – If installed and if it has an independent control panel it will require a separate NFPA 72 certificate from the building Fire Alarm Panel
- Dry Chemical suppression system – If installed and if it has an independent control panel it will require a separate NFPA 72 certificate from the building Fire Alarm Panel

#### **PROPER INSTALLATION OF DEVICES**

- Verify all dust covers have been removed. If still installed how was the 100% test done?
- Spot type smoke detectors shall not be located within 3 feet of a supply or return air diffuser, nor in a strong air stream from a supply diffuser at any distance.
- Wall-mounted smoke detectors must be installed between 4 and 12 inches from the ceiling (measured to the nearest edge of the detector), as required by NFPA 72.
- Wall mounted detectors shall not have wall-mounted luminaires or other obstructions below.
- Ceiling mounted smoke detectors shall be at least 4 inches from a wall or ceiling obstruction.
- All smoke detectors are analog addressable model(s) having a separate plug-in head, concealed locking device, and terminal strips for circuit connections.  
NOTE: Snap-ring mounted models with removable terminal strip plug for connection to loop conductors do not comply with the intent of this requirement and typically do not have a locking device to deter tampering.
- Verify that the isolation modules and addressable initiating device interface modules are located in a conditioned space (not attics, boiler rooms, unheated warehouses, damp locations, outside corridors, parking decks, etc.). Exception: Any devices that are specifically listed for the ambient conditions expected (or likely) in the area where installed.
- Verify that all detectors, modules and pull stations installed outside or in non-conditioned spaces are listed for use at the both ends of the expected temperature. (eg Typically addressable pull stations are not listed for use in parking decks because the low end is 32 degrees.)
- Verify that any strobes in walk-in coolers or freezers are listed for that environment or provided with heated Lexan enclosures for which they are specifically listed.
- Check any outside alarm bells and strobes for operation. Verify outside strobe is the weatherproof type with at least 100cd output, double flash, with clear lens.

#### **DUCT SMOKE DETECTORS**

- Intake tube has its holes /slots facing into the air stream, and a stopper installed to seal its far end.
- If the tube is over 36 inches long, the far end must be supported for stability. If support is provided by extending the intake tube through the far side of HVAC duct (best for inspection, cleaning, testing), the duct penetration must be sealed.

- Each duct smoke detector has a Remote Alarm Indicator Light (RAIL) in nearest corridor or other public space. (Because addressable, test switch is **not** required.)
- At each duct detector a 12"x12" minimum access door, hinged or latched type, is provided to facilitate sampling tube inspection and cleaning.
- Air flow direction is permanently indicated on the duct by stencil or decal, to help assure the sampling tubes are installed and maintained in the correct orientation.

#### **DACT**

- Verification of the dial out ability** or other means of remote alarm signaling
- Verify that DACT it is connected and functioning properly, to transmit fire alarm, supervisory, and trouble signals as separate, distinct events.
- Verify two phone lines are present and labeled when sprinkler is installed.
- Verify that DACT is programmed for 24-hour silent test call to the supervising station.
- Verify each type of signal is properly received and coded at the receiving station. (Supervisory signals include sprinkler valve tamper, fire pump off-normal, hi-low air pressure, etc.)
- Inspector is to personally talk to someone at the receiving station to verify alarm receipt

#### **PRINTER**

- The specification should require that systems with more than 100 addressable points, or in a building that exceeds 3 occupied floors or 60,000SF, an event printer is to be provided which uses ordinary non-thermal paper. In a high rise building, the printer must be FACU-monitored and on a generator-supported circuit.
  - NOTE: Printer does not have to be adjacent to FACU and, except for high rise buildings, does not have to be electrically supervised.

#### **OTHER SYSTEMS**

- For dormitories there will be special testing required for the sounder bases and the handicapped notification which uses higher candela strobes. Even if system is dual event it must dial out on 1<sup>st</sup> alarm.
- For institutions check for keys to the lockable pull stations if they are installed.
- Where smoke "sniffer" systems are used - create a test procedure with the help of the designer.
- Where beam detectors are used verify they are not on walls subject to movement and are not subject to direct sunlight.
- Where smoke evacuation &/or AHU bypass is used verify that the panel can be locked and operation limited to qualified people.
- Mass Notification systems require special procedures and testing to verify proper operation.

#### **TRAINING ETC**

- Verify that the Owner's designated personnel have received training in system operation: How to interpret, silence, and reset FACU signals, how to obtain service, etc.
- Verify that when required by specification, owner's personnel have received more thorough, detailed training in system troubleshooting and repair, plus installation manuals and other documentation, as applicable. (This is standard for the UNC-Chapel Hill campus.)
- Contractor has provided electronic copy of system's site-specific programming. (CD, flash drive)
- Contractor has provided spare parts in accordance with the specification for the project.

## REFERENCE INFORMATION TO ASSIST SYSTEM INSPECTION

After the required 100% system operational test the contractor submits a "final" copy of NFPA 72\* "Fire Alarm System Record of Completion" form. This form is to verify the proper operation of all (restorable) alarm initiating devices, audible and visible notification appliances, and other system functions including HVAC control, closure of smoke doors and dampers, pressurization fans, remote signaling, etc.

\*Use only the NFPA form, or an identical reprint. The NFPA 72 form will vary with the year the project was permitted. The year required should be listed in the project specification.

### NC Building Code, Chapter 35 Referenced Standards set the NFPA 72 version requirements

Projects permitted under NC Building Code 2002 - NFPA72 1999

Projects permitted under NC Building Code 2006 - NFPA72 1999

Projects permitted under NC Building Code 2009 - NFPA72 2002

Projects permitted under NC Building Code 2012 - NFPA72 2007

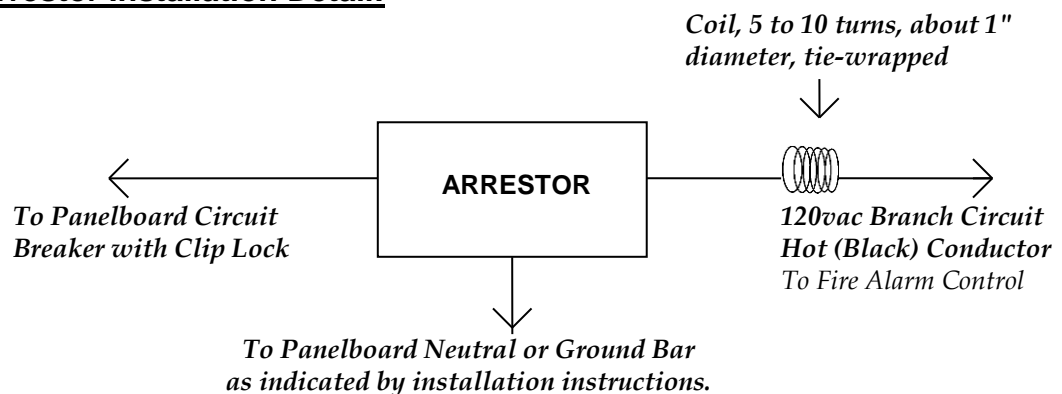
### NFPA 72 Chapters (note they vary by version year)

(1999) Chapters: 1-Fundamentals, 2-Initiating Devices, 3- Protected Premises, 4-Notification Appliances, 5- Supervising Station FA system, 6- Public FA reporting systems, 7-Inspection and Testing, 8-FA for Dwelling units, 9-Reference publications\_\_\_\_\_

(2002) Chapters: 1- Administration, 2-Referenced Publications, 3- Definitions, 4- Fundamentals, 5- Initiating Devices, 6- Protected Premises, 7- Notification Appliances, 8- Supervising Station FA system, 9- Public FA reporting systems, 10- Inspection and Testing, 11- Single and Multiple Station & Household\_\_\_\_\_

(2007) Chapters: 1- Administration, 2-Referenced Publications, 3- Definitions, 4- Fundamentals, 5- Initiating Devices, 6- Protected Premises, 7- Notification Appliances, 8- Supervising Station FA system, 9- Public FA reporting systems, 10- Inspection and Testing, 11- Single and Multiple Station & Household\_\_\_\_\_

### Transient Arrestor Installation Detail:



NOTE: Securely mount transient arrestor in accessible junction box or other proper metal enclosure adjacent to the panelboard, and provide engraved label indicating its location

## REFERENCE INFORMATION TO ASSIST SYSTEM INSPECTION

**Wiring:** All addressable system wiring shall be color coded in accordance with following scheme, which must be maintained throughout system, without color change in any run:

- Addressable Loop Controller Circuits: Cable per spec, with Red Jacket and Red(+) and Black(-) Conductors
- One-way Voice/Alarm and Two-way (Fireman's Telephone): Wire per specifications

**The following circuits use THHN / THWN conductors, of the size and color indicated:**

- Alarm Notification Appliance Circuits: AWG 14, Blue(+) and Black(-) conductors
- AHU Shutdown, Elevator Capture, other control functions: These are now done by addressable control relays on the loop. The relays may require separate power circuits, in which case use AWG 14 conductors, with Yellow (+) and Brown (-) color code. **NOTE: Check any power circuits to addressable relays for electrical supervision by disconnecting 1 lead.**
- Circuits that power door magnets from the FACU or SNAC panels: AWG 14, Orange
- Circuits from ZAM's to monitored initiating devices: AWG 16 or 14, Violet (+), Grey (-)
- NOTE: Most manufacturers either require or recommend low capacitance, twisted, shielded pair cable for Signaling Line Circuits (addressable loops). All shielded cable must have the grounded "drain" wire maintained continuously around the loop. If unshielded cable was used, verify that the manufacturer's installation instructions require or state a preference for use of unshielded cable. For addressable system retrofit when a non-addressable system had previously been in service, if existing single-conductor wiring from the old system was used (sometimes done if in fine condition, properly color coded, with terminal strips, etc.), verify that the manufacturer's installation instructions do not require the use of twisted pair conductors or low capacitance cable and the installer also agreed to replace the existing fire alarm system wiring if unsatisfactory performance is caused by its re-use (e.g., spurious signals, cross-talk, etc.).

**Spares:** Provide the following spare parts with the system, each individually packaged and labeled. For multi-building project calculate separately for each building with FACU:

- Fuses (If Used).....2 of each size in system
- Manual Fire Alarm Boxes.....2% of installed quantity
- Addressable Control Relays.....4% of installed quantity
- Indoor Horns/Speakers with Strobes Lights.....4% of installed quantity
- Indoor Strobe-only Notification Appliances.....4% of installed quantity
- Monitor Modules (Addressable Interface).....4% of installed quantity
- Isolation Modules / Isolation Bases.....4% of installed quantity
- Addressable, Electronic Heat Detectors.....4% of installed quantity
- Spot-Type Smoke Detectors / Sounder Bases.....6% of installed quantity

**NOTE: Increase decimal quantities of all spare parts to next higher whole number when calculating.**

**NOTE: No spares are required for projected beam, air sampling, or duct type smoke detectors.**