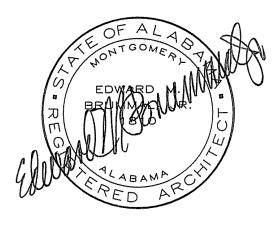
## PROJECT MANUAL

# The Armory Commission of Alabama

# PELHAM RANGE UTES 1, BLDG. 2 RESTORATION

IFB NO. AC-22-B-0036-S





PWBA Architects, Inc. PWBA 2020-0804 JULY 28, 2022 (with ADDENDUM 1, 8-17-2022)

#### SECTION 00 01 03 PROJECT DIRECTORY

#### **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

#### 1.02 OWNER:

#### THE ARMORY COMMISSION OF ALABAMA

Post Office Box 3711

1720 Cong. W.L. Dickinson Drive

Montgomery, AL 36109-0711

#### Mr. Eric Holt, Contracting Officer's Representative

(334) 260-6355 (Office)

(334) 414-4160 (Cell)

Kenneth.e.holt2.nfg@mail.mil

#### 1.03 CONSULTANTS:

A. **Architect:** Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

#### PWBA ARCHITECTS, INC.

529 South Perry Street, Suite 15

Montgomery, AL 36104-4636

Mr. Edward M. Brummal, Jr., AIA, CSI, CCS

(334) 244-4990, x226 (Office)

ebrummal@pwba-architects.com

#### B. Civil Engineer:

#### LARRY E. SPEAKS & ASSOCIATES, INC.

535 Herron Street

Montgomery, AL 36104

Mr. Steven Speaks, PE

(334) 262-1091

sspeaks@lespeaks.com

#### C. Plumbing & Mechanical Engineer:

#### **HHB ENGINEERS, PC**

104 Josie Run

Prattville, AL 36066

Mr. Tom Hattemer, PE

(334) 358-2707

Tom@HHBEng.com

#### D. Electrical Engineer:

**HCS GROUP PC** 

8401 Crossland Loop

Montgomery, AL 36117

Mr. Jacob Willis, PE

(334) 277-6737

jwillis@hcsgroupet.com

**PART 2 PRODUCTS - NOT USED** 

**PART 3 EXECUTION - NOT USED** 

**END OF SECTION** 

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# SECTION 00 01 07 PROFESSIONAL SEALS

#### **ARCHITECTURAL SPECIFICATIONS INDEX**

The following specification sections of the Project Manual have been assembled by **PWBA Architects**, **Inc.** and were prepared by me or under my responsible supervision.

#### <u>Division #</u> <u>Division Name</u>

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS All Sections.

DIVISION 01 – GENERAL REQUIREMENTS
All Sections, *except:*Section 01 57 13 – Temporary Erosion Control

DIVISION 02 – EXISTING CONDITIONS All Sections.

DIVISION 03 – CONCRETE All Sections.

DIVISION 04 – MASONRY All Sections.

DIVISION 05 – METALS All Sections.

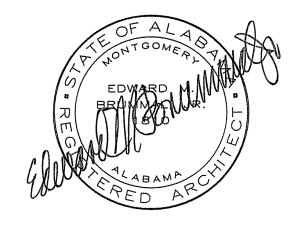
DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES All Sections.

DIVISION 07 – THERMAL AND MOISTURE PROTECTION All Sections.

DIVISION 08 – OPENINGS All Sections.

DIVISION 09 – FINISHES All Sections.

DIVISION 10 – SPECIALTIES All Sections.



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#### **CIVIL SPECIFICATIONS INDEX**

The following specification sections of the Project Manual have been assembled by **Larry E. Speaks & Associates**, **Inc.**, and were prepared by me or under my responsible supervision.

#### Division # Division Name

DIVISION 01 – GENERAL REQUIREMENTS
Section 01 57 13 – Temporary Erosion Control

DIVISION 31 – EARTHWORK Section 31 00 00 – Earth Moving

DIVISION 32 – EXTERIOR IMPROVEMENTS
Section 32 13.13.02 – Concrete Paving
Section 32 13 73 – Concrete Paving Joint Sealants
Section 32 92 19 – Seeding and Mulching

DIVISION 33 – UTILITIES
Section 33 41 00 – Site Storm Utility Drainage Piping



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## **DIVISION 22 AND 23 ENGINEER SEAL SHEET**



#### **ELECTRICAL SPECIFICATIONS INDEX**

The following specification sections of the Project Manual have been assembled by **HCS Group PC** and were prepared by me or under my responsible supervision.

Division # Division Name
DIVISION 26 ELECTRICAL

All Sections.

DIVISION 27 COMMUNICATIONS

All Sections.

DIVISION 28 FIRE ALARM

All Sections.



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#### PELHAM RANGE UTES 1 BLDG. 2 RESTORATION

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**END OF SECTION** 

00 01 15 - 2 LIST OF DRAWINGS

## SECTION 00 21 00 INSTRUCTIONS TO BIDDERS

#### **PART 1 GENERAL**

#### 1.01 INTENT OF INSTRUCTION:

A. Instructions to Bidders are included in the Contract Documents to amplify the invitation for Bids, which is abbreviated because of cost and space limitations, and to five other details which interested parties must or should know in order to prepare bids properly.

#### 1.02 PREQUALIFICATION OF BIDDERS:

- A. Bidders for work costing in excess of \$50,000.00 must be licensed under the terms of existing State laws. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture. Before award of any Contract, any Bidder may be required to file under oath with the Commission a complete Confidential Financial Statement, Equipment Questionnaire, and Experience Questionnaire on forms that will be furnished by the Contracting Officer with the request. If the applicant is a corporation organized in a state other than Alabama, it shall furnish a certificate from the Secretary of State showing that it is qualified to transact business in Alabama.
- B. Copies of the Contract Documents may be obtained from the Contracting Officer, as stated in the Invitation For Bids.

#### 1.03 EXAMINATION OF CONTRACT DOCUMENTS AND OF THE SITE OF THE WORK:

- A. Before submitting a proposal for the work, the bidders shall carefully examine the Contract Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site, and any other work being performed thereon at the time of submission of their bids. They shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Work for which they submit their proposals. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and visit and has judged for and satisfied himself as to conditions to be encountered regarding the character, difficulties, quality and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements and contingencies involved.
- B. If, in the performance of the Contract, subsurface or latent conditions are found to be materially different from those indicated by the Drawings and Specifications, or unknown conditions of an unusual or impractical nature are disclosed differing materially from conditions usually inherent in work of the character shown and specified, the attention of the Engineer shall be called immediately to such conditions before they are disturbed. Upon such notice, or upon observation of conditions, the Engineer will promptly make such changes in the Drawings and/or Specifications as he finds necessary to conform to the different conditions, and any increase or decrease in the cost of the Work resulting from such changes will be adjusted as provided under CHANGES IN THE WORK or EXTRA WORK as set forth in the GENERAL CONDITIONS.

#### 1.04 EXPLANATIONS AND INTERPRETATIONS:

A. Should any bidder observe any ambiguity, discrepancy, omission, or error in the Drawings and Specifications, or in any other Contract Document, or be in doubt as to the intention and meaning thereof, he should at once report such to the Engineer and request clarification, in writing, with a copy of his request to the Contracting Officer. Clarification will be made only by written addenda sent to all prospective bidders. Neither the Engineer, nor the Contracting Officer will be responsible in any manner for verbal answers regarding intent or meaning of the Contract Documents, or for any verbal instructions, by whomsoever made, prior to the award of the Contract.

- B. Should conflict occur in or between Drawings and Specifications, a bidder will be deemed to have estimated on the more expensive way of doing the work involved unless he shall have asked for and
- C. obtained the written decision of the Engineer before submission of his bid as to method, materials, or equipment which will be required.

#### 1.05 CONTENTS OF PROPOSAL FORMS:

A. The Contracting Officer as stated in the advertisement, will furnish bidders blank bid forms for the work contemplated, indicating the lump sum bid items, alternate bid items, and unit price bid items.

#### 1.06 LIQUIDATED DAMAGES:

A. Time is the essence of the Contract and the bidder's attention is called to that clause of the GENERAL CONDITIONS which requires the deduction of a stipulated time charge equal to six percent interest per annum on the total Contract Price for the work for the entire period that any part of the work remains uncompleted after the time specified in the Contract documents for completion of the work which will be deducted by the Contracting Officer from the final estimate and retained by the Owner out of the moneys otherwise due the Contractor in the final payment, not as a penalty but as liquidated damages sustained by the Owner.

#### 1.07 PREPARATION OF BID:

- A. The bid must be submitted on the bid form furnished by the Owner or Contracting Officer as stated in the Invitation for Bids.
- B. The bid shall be properly signed by the bidder. If the bidder is an individual, his name and post office address must be shown; if a firm or partnership, the name and post office address of each member of the firm or partnership must be shown; if a corporation, the President, Vice-President, or Secretary shall sign and affix the corporate seal, or if the person signing the bid is an agent, the said agent must attach written authorization from the President, Vice-President or Secretary of the corporation, and the bid must show the name of the corporation, the name of the state under the laws of which the corporation is chartered and the names, titles, and business address of the officers.

#### 1.08 BID GUARANTY:

A. No bid submitted will be considered unless accompanied by a certified check or bid bond made payable to the Owner in an amount not less than five percent (5%) of the Contractor's bid, but in no event more than ten thousand dollars (\$10,000.00), as a guaranty that the bidder will enter into a contract with the Owner for the Performance of the work and furnish contract bonds for the work if it be awarded to him.

#### 1.09 DELIVERY OF BIDS:

A. Each Bid shall be placed, together with Bid Guaranty, in a sealed envelope on the outside of which is written in large letters "Bid" and so marked as to identify the Work bid on and the name of the Bidder. Bid may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, preferable special delivery or registered, the sealed Bid marked as indicated above, shall be enclosed in another envelope for mailing. Bid will be received at the place stated and until the hour of the date set in Invitation for Bids for their opening unless notice is given of postponement. No Bid will be accepted or considered which has not been received prior to the hour of the opening date.

#### 1.10 WITHDRAWAL OR REVISION OF BIDS:

A. A Bid may be withdrawn at any time prior to the hour fixed for opening of Bids, provided a request in writing executed by the Bidder or his duly authorized representative is filed with the Contracting Officer prior to that time, in which case such Bid, when received will be returned to the Bidder unopened. Telegrams or written communications to correct Bid will be accepted and the Bid corrected in accordance therewith if received by the Contracting Officer prior to the hour set in the Invitation for Bids. No Bid shall be withdrawn, modified, or corrected after the hour set for opening such Bid.

#### 1.11 OPENING OF BIDS:

A. Bids will be opened and read publicly at the time and place indicated in the Invitation for Bids. Bidders or their authorized agents are invited to be present.

#### 1.12 IRREGULAR BID:

A. Bids may be rejected if they contain any omissions, alterations of forms, additions not called for, conditional bids, alternate bids unless called for, incomplete bids, erasures, or irregularities of any kind. Bids in which the unit or lump sum prices bid are obviously unbalanced may be rejected.

#### 1.13 ERRORS IN BID:

A. In case or error in the extension of prices, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

#### 1.14 DISQUALIFICATION OF BIDDERS:

- A. Any Bidder using the same or different names for submitting more than one Bid upon any unit, portion, part or section of work will be disqualified from further consideration on that part of the Work. Evidence that any bidder is interested, as a principal, in more than one Bid for the Work (for example, bidding in a partnership; as a joint partnership or association and as a Partnership, association, or individual) will cause the rejection of any such Bid. A Bidder may, however, submit a Bid as a principal and as a subcontractor to some other principal, or may submit a Bid as a subcontractor to as many other principals as he desires, and by so doing will not be liable to disqualification.
- B. If there is reason for believing that collusion exists among the bidders any or all Bids may be rejected, and participants in such collusion may not be considered in future Bids for the same work. Bids in which prices are obviously unbalanced or unresponsive to the Invitation for Bids may be rejected.
- C. The right is reserved to reject a Bid from Bidder who has not paid, or satisfactorily settled, all bills due for labor and material on former contracts in force at the time of letting.

#### 1.15 CONSIDERATION OF BIDS:

A. After the Bids are opened and read, the Bid prices will be compared and the results of such comparison will be made public. Until the final award of the Contract, however, the Owner reserves the right to reject any all Bids, and to accept or reject any or all items of any bid and to waive technical errors and any informality if, in his judgement, the best interests of the Owner will thereby be promoted.

#### 1.16 DETERMINATION OF LOW BIDDER:

A. The low bidder will be determined by the total Bid of all Items on the bid form that are accepted.

#### 1.17 AWARD OF CONTRACT:

A. The Contract will be awarded to the lowest responsible bidder complying with all established requirements of the Contract Documents unless the Owner finds that his bid is unreasonable or that it is not in the interest of the Owner to accept it, and subject to the Owner' right to award on the basis of any bid item or any combination of bid items. A bidder to whom award is made will be notified at the earliest possible date.

#### 1.18 RETURN OF BID GUARANTIES:

- A. All Bid Guaranties, except those of the three lowest bona fide bidders, will be returned immediately after Bids have been checked, tabulated, and the relation of the Bid established. The Bid Guaranty of the three lowest bidders will be returned as soon as the Contract Bonds and the Contract of the successful Bidder have been properly executed and approved. Should no award be made within thirty days, all Bids will be rejected, and all quaranties returned, unless the successful Bidder agrees
- B. in writing to a stipulated extension in time for consideration of his bid, in which case the Owner may, at his discretion, permit the successful Bidder to substitute a satisfactory bidder's bond for the certified check submitted with his Bid as a Bid Guaranty.

#### 1.19 EXECUTION OF CONTRACT:

A. The Contract shall be signed by the successful Bidder, in the number of counterparts provided in the Contract Agreement, and returned to the Contracting Officer with satisfactory Contract Bonds.

#### 1.20 REQUIREMENTS OF CONTRACT BONDS:

- A. In order to insure the faithful performance of each and every condition, stipulation, and requirement of the Contract and to indemnify and save harmless the Owner from any and all damages, either directly or indirectly (arising out of any failure to perform same), the successful Bidder to whom the Contract is awarded shall furnish at his expense and file with the Contracting Officer an acceptable Surety Bond in the amount equal to one hundred (100) per cent of the Contract Price of the Contract as awarded. Said Bond shall be made on the approved Bond form, shall be furnished by a surety company duly authorized and qualified to make such bonds in the State of Alabama, shall be countersigned by an authorized agent resident in the State who is qualified for the execution of such instruments, and shall have attached thereto power of attorney of the signing official. In case of default on the part of the Contractor, all expenses incident to ascertaining and collecting losses suffered by the State under the Bond, the direct costs of administration, architectural, engineering, and legal services, shall lie against the Contract Bond for Performance of the Work.
- B. In addition thereto, the successful Bidder to whom the Contract is awarded shall furnish at his expense and file with the Contracting Officer another Bond with good and sufficient surety payable to the Owner in an amount equal to fifty (50) per cent of the Contract Price, with the obligation that the Contractor shall promptly make payment to all persons furnishing him or them with labor, materials, equipment, or supplies for or in prosecution of the Work provided for in the Contract and for the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in suits on said Bond.

#### 1.21 APPROVAL OF CONTRACT:

A. No Contract is binding upon the Owner until it has been executed by the Contracting Officer and approved by the Chief National Guard Bureau, and/or the State Building Commission as required by Federal and State laws and regulations.

#### 1.22 FAILURE TO EXECUTE CONTRACT:

A. Should the successful Bidder or Bidders to whom a Contract is awarded fail to execute a Contract and furnish acceptable Contract Bonds within ten days following the date of Award, the Owner shall retain form the Proposal Guaranty if it be a certified check or recover from the Principal of the Sureties if the guaranty be a bond the difference between the amount of the Contract as awarded and the amount of the proposal of the next lowest bidder. If no other bids are received, the full amount of the Proposal Guaranty shall be so retained or recovered as liquidated damages for such default. Any sums so retained or recovered shall be the property of the Owner. In the event of the death of the low bidder (if an individual and not a partnership or corporation) between the date of the opening of bids and the ten days following the date of award of Contract allowed for furnishing the Contract Bonds, the Owner shall return the Proposal Guaranty intact to the estate of the deceased low bidder.

B. Failure by the Owner to complete the execution of a Contract and to issue a Notice to Proceed within thirty (30) days after its Presentation by the Contractor shall be just cause, unless both parties agree in writing to a stipulated extension in time for issuance of a Notice to Proceed, for withdrawal of the Contractor's bid and Contract Agreement without forfeiture of a certified check or bond.

PART 2 PRODUCTS – NOT APPLICABLE PART 3 EXECUTION – NOT APPLICABLE

**END OF SECTION** 

## SECTION 00 31 00 AVAILABLE PROJECT INFORMATION

#### **PART 1 GENERAL**

#### 1.01 EXISTING CONDITIONS

- A. Roof Survey: Photographs of existing roof conditions are available to bidders, as follows:
  - 1. **Roof Survey Photos:** Roof Asset Management, Inc. conducted a roof survey and issued photos on December 31, 2020 (6 pages, copies attached).
    - a. These photos are provided for the Bidders' information only; they do not constitute contract requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**END OF SECTION** 

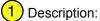
www.roof-asset.com - Florida Architecture Certificate of Authorization 26000505

## Site Plan and Photo Locations:



Post Office Box 320426, Tampa, FL 33679 Phone: 800-683-0825 Fax: 863-583-0356 www.roof-asset.com - Florida Architecture Certificate of Authorization 26000505





Overview - Exterior Building Elevation



2 Description:

Overview - Existing Metal Canopy Over Front Door



3 Description:

Overview - Existing metal roof system at main high roof area over work bays.



4 Description:

Overview - Existing metal roof system at main low roof area over offices / administration.

Post Office Box 320426, Tampa, FL 33679 Phone: 800-683-0825 Fax: 863-583-0356 www.roof-asset.com - Florida Architecture Certificate of Authorization 26000505



## 5 Description:

Overview - Existing metal roof system at canopy over front door.



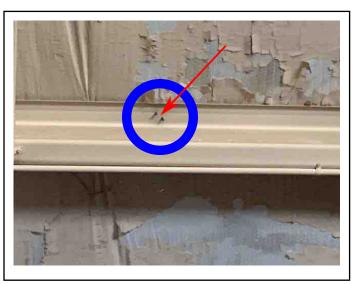
## 6 Description:

Overview - Existing trapezoidal metal roof panel profile.



## 7 Description:

Overview - Interior view of existing steel framing and vinyl-backed insulation below metal roof system.



## 8 Description:

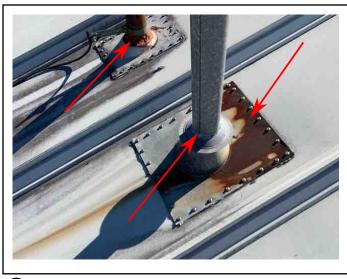
Interior view of existing steel framing and vinyl-backed insulation below metal roof system - Existing metal roof panels mechanically attached through the steel framed structure.

Post Office Box 320426, Tampa, FL 33679 Phone: 800-683-0825 Fax: 863-583-0356 www.roof-asset.com - Florida Architecture Certificate of Authorization 26000505



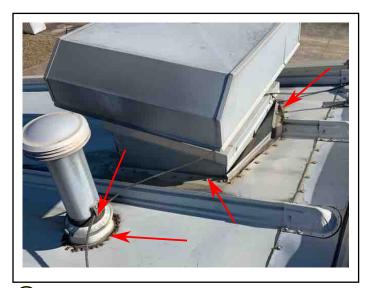
## 9 Description:

Evidence of deterioration and previous repairs visible at existing roof penetrations.



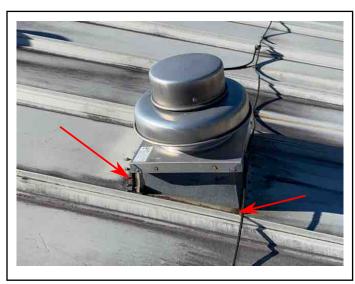
## 10 Description:

Evidence of deterioration and previous repairs visible at existing roof penetrations.



## 11) Description:

Evidence of deterioration and previous repairs visible at existing roof penetrations and curbs.



## 12 Description:

Evidence of deterioration and previous repairs visible at existing roof penetrations and curbs.

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Project: UTES 1 Building 2 (#8424) Inspection Date: Dec 22 2020





Evidence of deterioration and previous repairs visible at various roof flashings and exposed fasteners.



14 Description:

Evidence of deterioration and previous repairs visible at various roof flashings and exposed fasteners.



15 Description:

Deterioration visible at existing gutters and edge metal flashings.



16 Description:

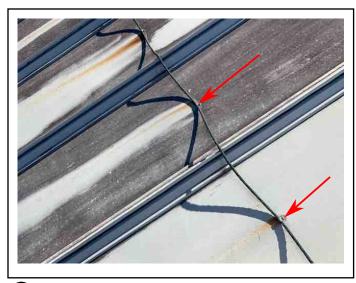
Deterioration visible at existing gutters and edge metal flashings.

Post Office Box 320426, Tampa, FL 33679 Phone: 800-683-0825 Fax: 863-583-0356 www.roof-asset.com - Florida Architecture Certificate of Authorization 26000505



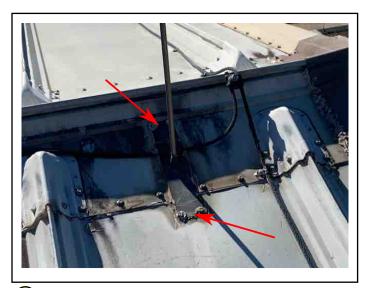
## 17) Description:

Oxidization, algae, and rust visible at multiple panels throughout the roof.



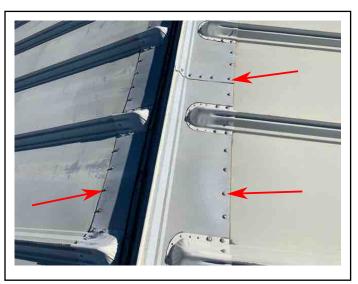
### 18 Description:

Existing lightning protection system rods and cables were previously attached to the metal roof panels with exposed fasteners with rust, deterioration, and previous repairs visible at these locations.



## 19 Description:

Existing lightning protection system rods and cables were previously attached to the metal roof panels with exposed fasteners with rust, deterioration, and previous repairs visible at these locations.



## 20 Description:

The replacement of multiple exposed fasteners has been previously performed throughout the existing ridge cap flashing components.

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SECTION 00	41 00 - PROPOSAL FORM	IFB # AC-22-B-0036-S BID OPENING DATE
		BIDDER
		CONTRACTOR'S LICENSE NO.
TO:	The Armory Commission of Alab State Military Property and Disbursi Headquarters, Alabama National G 1720 Cong. W.L. Dickinson Drive Montgomery, Alabama 36109-0711	ing Officer uard
PROJECT:	Pelham Range UTES 1, Bldg. 2 R Alexandria, Alabama	estoration
undersigned l all work for th and addenda	e above-described project in strict ac	abor, materials, and equipment and perform cordance with the specifications, drawings, deration of the following prices (bid prices do
	BID	
PERFORM A	LL WORK IN ACCORDANCE WITH T	THE DRAWINGS & SPECIFICATIONS FOR:
Pelham Rang	ge UTES 1, Bldg. 2 Restoration - A0	C-22-B-0036-S:
BASE BID		\$
	ACCOUNTING OF	SALES TAX
	ct 2013-205, section 1(g) the Contrac	tor accounts for sales tax NOT in the bid form
as follows:		ESTIMATED SALES TAX AMOUNT
BASE BID		\$
		I render the bid non-responsive. Other than ng shall not affect the bid pricing nor be

considered in the determination of the lowest responsible and responsive bidder.

TIME LIMIT: These bids are subject to an acceptance period of thirty (30) days.

- All amounts and totals given will be subject to verification by the State. In case of variation between unit bid price and total shown by bidder, the unit price will be considered to be his bid. The State reserves the right to award the work on the basis of any bid or any combination of bids and to increase or decrease the quantities of any item listed in this bid at the price quoted for that particular item.
- Bids shall be for the entire work and shall have each blank space filled in to include the "Estimated B. Sales Tax Accounting".

PROPOSAL FORM 00 41 00-1

IFB # AC	-22-B-0036-S	
<b>BIDDER</b>		

- C. The quantities of each item of the bid as finally ascertained at the close of the contract will determine the total payment to accrue under the contract.
- D. The bidder, upon request of written notice of award of the contract within thirty (30) days after the date of opening of bids, agrees that he will execute the construction contract in accordance with this bid as accepted, and if the consideration of the contract will exceed \$50,000.00 in amount, will furnish to the State a Performance Bond and a Payment Bond on AGO Forms, with good and sufficient surety or sureties as required by the specifications, at the time the contract is executed.
- E. It is hereby warranted that in the event award is made to the undersigned, there will be furnished under this contract or used in the performance of the work covered by this contract, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as indicated in the bid documents.
- F. The bidder further agrees that if awarded the contract, he will commence work within ten (10) calendar days after notice to proceed date and that he will fully complete the work ready for use not later than **410 calendar days** after notice to proceed date.

FIRM
ADDRESS
PHONE
FAX
EMAIL
BY
SIGNATURE
PRINTED NAME
TITLE
STATE OF ALABAMA CONTRACTOR'S LICENSE NO.

PROPOSAL FORM 00 41 00-2

IFB # AC	-22-B-0036-S	
BIDDER		

#### NOTES:

All bidders must be licensed under the provisions of Title 34, Chapter 8, <u>Code of Alabama, 1975</u>, as amended.

On projects bid at \$50,000.00 or more, the bidder must include his license number on the bid form in the prescribed place and on the outside of the envelope containing the bid, or otherwise the bid will not be considered.

Bid Prices do not include Sales or Use Taxes but these taxes are identified in the Estimated Sales Tax Amount section of this bid form.

PROPOSAL FORM 00 41 00-3

#### SECTION 00 43 00 - FORM OF BID BOND

#### **BID BOND**

A completed/executed Standard Bid Bond form (Building Commission Form, AIA Form, GSA Standard Form, etc.) [A Power of Attorney is **REQUIRED** for all Bid Bonds] or a certified check made payable to the Armory Commission of Alabama in an amount not less than five (5) percent of the Contractor's bid, but in no event more than ten thousand dollars (\$10,000.00), must accompany all bids greater than \$50,000.00.

#### **END OF SECTION**

FORM OF BID BOND 00 43 00-1

# SECTION 00 43 25 - SUBSTITUTION REQUEST FORM DURING BIDDING (Revision Date - 14 Jan 21)

(BIDDERS SHALL USE THIS FORM FOR SUBMITTING SUBSTITUTION REQUESTS DURING BIDDING. OTHER FORMS OF SUBSTITUTION REQUESTS WILL NOT BE CONSIDERED. THIS FORM MUST BE RECEIVED BY ARCHITECT NOT LATER THAN 7 WORKING DAYS PRIOR TO BID OPENING DATE)

Project: (Project Name)			Substitution Request Number:		
IFB Project N	No.: IFB #: AC- <mark>(F</mark>	<mark>Y)</mark> -B- <mark>(xxxx)</mark> -S	Re:		
From:			_		
				Section:	
Description:			Page:	Article/Paragraph:	
Proposed Substitution	:				
		Address:	Phone:		
Trade Name:	:		Model No.:		
Installer:		Address:		Phone:	
History:	New Product	1 – 4 years old	5 – 10 years	old Exceeds 10 years old	
Differences	between propos	ed substitution and	specified produc	t:	
Reason for r	not providing sp				
Similar Insta	ıllation:				
Project:			Architect:		
Address:				Commission of Alabama	
		s other parts of Wo		<b>.</b>	
Savings to C	Owner for accept	ing substitution (in	clude rough orde	of magnitude): \$	
	ubstitution changuct]		include rough ord	ler of magnitude):NoYes	
Supporting I	Data Attached:				
Drawings	Product Data	Samples	Tests Repo	orts	

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:	Signed By:	
Firm:		
Address:		
Telenhone:	Fax:	
E-mail:		
Attachments:		



# State of Alabama

# Disclosure Statement

Required by Article 3B of Title 41, Code of Alabama 1975

ENTITY COMPLETING FORM	
ADDRESS	
CITY, STATE, ZIP	TELEPHONE NUMBER
STATE AGENCY/DEPARTMENT THAT WILL RECEIVE GOODS, SERVICE	ES, OR IS RESPONSIBLE FOR GRANT AWARD
ADDRESS	
CITY, STATE, ZIP	TELEPHONE NUMBER
This form is provided with:	est for Proposal Invitation to Bid Grant Proposal
Agency/Department in the current or last fiscal years.  Yes No	at that received the goods or services, the type(s) of goods or services previously
Agency/Department in the current or last fiscal years.  Yes No	ny related business units previously applied and received any grants from any S ar? awarded the grant, the date such grant was awarded, and the amount of the gran
STATE AGENCY/DEPARTMENT	DATE GRANT AWARDED AMOUNT OF GRANT
any of your employees have a family relationsl	ublic officials/public employees with whom you, members of your immediate family and who may directly personally benefit financially from the proposed transact the public officials/public employees work. (Attach additional sheets if necessary
NAME OF PUBLIC OFFICIAL/EMPLOYEE	ADDRESS STATE DEPARTMENT/AGEN
1	

FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED
	ADDRESS	POBLIC ENIFECTEE	AGENCT WHERE EMPLOTED
If you identified individuals i	in items one and/or two above, desc	ribe in detail below the direct financial ber	nefit to be gained by the public
officials, public employees,		result of the contract, proposal, request fo	
- TOUR TRANSPORT - TOUR STORE ST	이용 이 그림, [10] 아이는 그 아이는 이를 하는 때문에는 아니는 아이는 것이다면 하는데 하는데 하는데 다음 때문에 다른데 다음을 다 되었다면 하는데	ned by any public official, public employee, roposal, request for proposal, invitation to	
List below the name(s) and posal, invitation to bid, or gr		and/or lobbyists utilized to obtain the contr	ract, proposal, request for pro-
NAME OF PAID CONSULTANT/L	OBBYIST	ADDRESS	
to the best of my knowled		r that all statements on or attached to ti il penalty of ten percent (10%) of the an orrect or misleading information.	
to the best of my knowled	ge. I further understand that a civi	il penalty of ten percent (10%) of the an	

2. List below the name(s) and address(es) of all family members of public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the

Article 3B of Title 41, Code of Alabama 1975 requires the disclosure statement to be completed and filed with all proposals, bids, contracts, or grant proposals to the State of Alabama in excess of \$5,000.

### 00 52 00 - CONSTRUCTION CONTRACT FORM

### STATE OF ALABAMA

### THE ARMORY COMMISSION OF ALABAMA

### CONSTRUCTION CONTRACT

OWNER:	THE ARMORY COMMISSION OF ALABAMA P.O. BOX 3711 MONTGOMERY, ALABAMA 36109-0711
CONTRACTOR:	(Contractor's Name) (Street Address) (City, State Zip)
CONTRACT FOR:	(Project Name)
CONSTRUCTION LOCATION: AMOUNT:	(Project City, State) (Dollar Amount)
PAYMENT TO BE MADE BY:	STATE OF ALABAMA
FEDERAL:	
STATE:	

### CONTRACT AGREEMENT FOR CONSTRUCTION

THIS AGREEMENT, entered into this (day) day of (month) (year) by and between The Armory Commission of Alabama (hereinafter called the Owner), and (Contractor Name)(hereinafter called the Contractor).

WITNESSETH that the Owner and the Contractor, in consideration of premises of the mutual covenants, considerations, and agreements herein contained, agree as follows:

STATEMENT OF WORK: The Contractor shall furnish all labor and materials and perform all work for (**Project Name**) in strict and entire conformity with the plans and specifications dated (**Date**) prepared by (**Architect/Engineer**) and approved by The Armory Commission, including Addenda thereto numbered (**Number**), all of which are hereby made a part of this agreement as fully and to the same effect as if the same had been set forth at length in the body of this Agreement.

TIME OF COMPLETION: The work shall be commenced on a date to be specified in a written proceed order of the Contracting Officer and shall be completed within (# of Days) from and after said date as provided in the Contract documents.

### 00 52 00 - CONSTRUCTION CONTRACT FORM

COMPENSATION TO BE PAID: The Owner will pay and the Contractor will accept in full consideration for the performance of the Work, subject to additions and deductions (including liquidated damages) as provided in the Contract Documents, the sum of (Contract Amount), being the amount of the Contractor's bid for the aforesaid work, including bid items (Awarded Items). The Contractor and the Owner for themselves, their successors, executors, administrators, and assigns, hereby agree to the full performance of the covenants herein contained.

COMPLIANCE WITH ADDITIONAL STATE REQUIRED CLAUSES: By signing this contract, the Contractor hereby certifies compliance and agreement with the following clauses required by the State of Alabama:

- 1. In compliance with Act No. 2012-491, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom;
- 2. In compliance with Act 2016-312, the Contractor hereby certifies that it is not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade;
- 3. In compliance with the merit system exclusion clause, the Contractor understands

### CONTRACT NO. AC-(FY)-C-(xxxx)-S

### 00 52 00 - CONSTRUCTION CONTRACT FORM

and agrees that the Contractor is not to be considered a State of Alabama merit system employee and is not entitled to any benefits of the State Merit System;

4. By entering into this contract, the Contractor is not an agent of the state, its officers, employees, agents or assigns. The Contractor is an independent entity from the State and nothing in this agreement creates an agency relationship between the parties.

IN WITNESS WHEREOF, the Parties hereto and on the day and year first above written have executed this Agreement in Three counterparts, each of which shall without proof or accounting for the other counterparts, be deemed as original thereof.

This Contract was let in accordance with the provisions of Title 39, Code of Alabama 1975 as amended, and applicable sections of Department of Defense Armed Services Procurement Regulation. The terms and commitments of this Contract do not constitute a debt of the State of Alabama in violation of Article 11, Section 213 of the Constitution of Alabama, 1901, as amended by Amendment Number 26.

### CONTRACT NO. AC-(FY)-C-(xxxx)-S

### 00 52 00 - CONSTRUCTION CONTRACT FORM

WITNESSES:	CONTRACTING PARTIES:
	(Contractor's Name) Contractor
	(Signature)
This contract has been reviewed for legal rules, and regulations of the State of Alaban	form and complies with all applicable laws, na governing these matters.
	JAMES R. HOUTS Deputy Attorney General
This contract has been reviewed for and is a	approved as to content.
	MARK A. WEEKS State Property & Disbursing Officer

 $\underline{\mathsf{NOTE}}\text{:} \ \ \mathsf{If} \ \mathsf{the} \ \mathsf{Contractor} \ \mathsf{is} \ \mathsf{a} \ \mathsf{corporation}, \ \mathsf{witnesses} \ \mathsf{are} \ \mathsf{not} \ \mathsf{required}, \ \mathsf{but} \ \mathsf{the} \ \mathsf{annexed} \\ \mathsf{certificate} \ \mathsf{must} \ \mathsf{be} \ \mathsf{completed}. \ \ \mathsf{Type} \ \mathsf{or} \ \mathsf{print} \ \mathsf{names} \ \mathsf{under} \ \mathsf{all} \ \mathsf{signatures}.$ 

### CONTRACT NO. AC-(FY)-C-(xxxx)-S

### 00 52 00 - CONSTRUCTION CONTRACT FORM

ATTEST:	The Armory Commission of Alabama
MARK A. WEEKS Secretary The Armory Commission	SHERYL E. GORDON Major General, ALNG The Adjutant General
ATTEST:	APPROVED:
JOHN H. MERRILL Secretary of State of Alabama	KAY IVEY Governor, State of Alabama

### 00 52 00 - CONSTRUCTION CONTRACT FORM

### **CERTIFICATE**

l,,	certify that I am the	of the corporation
named as Contractor here	ein; that <u>xxxxxxxxx</u> .	_, who signed this contract on
behalf of the Contractor, v	was then the <u>xxxxxxxxx</u>	of said corporation; that said
Contractor was duly signe	ed for and in behalf of said co	orporation by authority of its
governing body, and is wi	ithin the scope of its corpora	te powers.
(SEAL)		

<u>NOTE</u>: Contractor, if a corporation, should cause the above certificate to be executed under its corporate seal. <u>THE SAME OFFICER SHALL NOT EXECUTE BOTH THE CONTRACT AND THE CERTIFICATE</u>.

<u>NOTE</u>: In the event that the Contractor is not a corporation, the signature page must be witnessed by two individuals and this page may be left blank.

### **SECTION 00 61 13 - PERFORMANCE BOND FORM**

AGO Form 215 PERFO (16 Apr 80) (MOD JUL 87) (See In (Page 1 of 3)	DRMANCE BOND DATE BOND EXECUTED structions Attached)
PRINCIPAL (Legal name and business address)	TYPE OF ORGANIZATION  ("X" Out)  Individual Partnership Joint Venture Corporation State of Incorporation
SURETY(IES) (Name and business a	ddress)
Penal Sum of Bond (Express in words & figu	ires)
Contract Number	Contract Date
bound to the Armory Commission of Alaba bind ourselves, our heirs, executors, admini That, where the Sureties are corporations act sum "jointly and severally" as well as "sev actions against any or all of us, and for all of with the Principal, for the payment of such s but if no limit of liability is indicated, the lim	S, That we, the Principal and Surety(ies) hereto, are firmly ima in the above penal sum for the payment of which we istrators, and successors, jointly and severally: <i>Provided</i> , ting as co-sureties, we, the Sureties, bind ourselves in such rerally" only for the purpose of allowing a joint action or ther purposes each Surety binds itself, jointly and severally sum only as is set forth opposite the name of such Surety, nit of liability shall be the full amount of the penal sum.
contract identified above:	in 18 SUCH, that whereas the Principal entered into the
NOW, THEREFORE, if the Principal shall:	
said contract during the original term of said by the Armory Commission of Alabama thr Surety(ies), and during the life of any guaran fulfill all the undertakings, covenants, terms,	rtakings, covenants, terms, conditions, and agreements of d contract and any extensions thereof that may be granted ough its Contracting Officer, with or without notice to the nty required under the contract, and shall also perform and , conditions, and agreements of any and all duly authorized ereafter be made, notice of which modifications to the

AGO Form 215 (16 Apr 80) (Page 2 of 3) (MOD Jul 87)

- (b) PROVIDED, further, that upon the failure of the said PRINCIPAL to promptly and efficiently prosecute said Work, in any respect, in accordance with the Contract Documents, the above bound Surety(ies) shall take charge of said work and complete the Contract at his/their own expense, pursuant to its terms, receiving, however, any balance of the funds in the hands of said The Armory Commission of Alabama due under said contract.
- (c) The Invitation for Bids, Instructions to Bidders, Proposal, General and Special Conditions of the Contract, Detailed Specification Requirements, and Drawings, and the Contract Agreement hereinbefore referred to, and the Bond for the Payment of Labor, Materials, Food-stuffs, or Supplies executed under the provision of Chapter 1, Title 39, Alabama Code of 1975, are made a part of this obligation, and this instrument is to be construed in connection therewith.
- (d) If the said contract is subject to the Miller Act, as amended (40 U.S. Code 270a-270e), pay to the U.S. of America the full amount of the taxes imposed by the U.S. Government which are collected, deducted, or withheld from wages paid by the Principal in carrying out the construction contract with respect to which this bond is furnished; then the above obligation shall be void and of no effect.

		te set forth above			citorinance bend and	inve arrived
			PRINCIP	AL		
Sign	natures(s)	1.	(Seal)	2.	(Seal)	Corporate
7	nne(s) & Fitle(s) Types)					Seal
		W. 1	CORPORATE SU	RETY(IES)		2-1
AU3	Name & Address (Typed)		Sta	ate of Inc.	Liability Limit	
V Signature(s	s) 1.	2.			Corporate Seal	
	Names(s) of Title(s) (Typed)	& 1.	2.			
ACRES -	Name & Address (Typed)		Sta	ate of Inc.	Liability Limit	
Surety B	Signature(	s) 1.	2.			Corporate Seal
**	Names(s) a Title(s) (Typed)	& 1.	2.	2.		
	P	Bond remium	Rate Per Th	ousand	Total	

AGO Form 215 (16 Apr 80) (Page 3 of 3) (MOD JUL 87) INSTRUCTIONS

- This form is authorized for use in connection with contracts for construction work or the furnishing of supplies or services. There shall be no deviation from this form without approval by the Armory Commission of Alabama.
- 2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the second page of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.
- 3. Corporations executing the bond as sureties must be licensed to do business in the State of Alabama. Where more than a single corporate surety is involved, their names and addressed (city and state) shall be inserted in the spaces (Surety A, Surety B) headed "CORPORATE SUETY(IES)", and in the space designated "SURETY(IES)" on the front page of this form, only the letter identification of the Sureties shall be inserted. Evidence of authority must be attached.
- Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal".
- 5. The name of each person signing this performance bond should be typed in the space provided.

**END OF SECTION** 

### **SECTION 00 61 16 - PAYMENT BOND FORM**

AGO Form 214	PAYMENT BOND	Date bond executed
5 AUG 82 (MOD 29 Л	A. C.	
Page 1 of 2	(See Instructions Attache	ACTION AND ADDRESS OF THE ACTION AND ADDRESS
PRINCIPAL (Legal na	me and business address)	TYPE OF ORGANIZATION  ("X" Out)  Individual  Partnership  Joint Venture  Corporation  State of Incorporation
SURETY (IES) (Name	e and Business Address)	
Penal Sum of Bond (Ex	epress in words & figures)	
Contract No.:		Contract Date:

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the Armory Commission of Alabama in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: Provided, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor, equipment or supplies, and material in the prosecution of the work provided for in said contract and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived, then the above obligation shall be void and of no effect; otherwise to remain and be in full force and effect.

PROVIDED, further, in the event that the said Principal, as such Contractor, shall fail to make prompt payment to all persons supplying him or them with labor, materials, feed-stuffs, or supplies for or in the prosecution of the Work provided for in such Contract, the above bound Surety(ies) shall be liable for the payment of reasonable attorney's fees incurred by successful claimants or plaintiffs in suits on said bond as provided in Chapter 1, Title 39, Code of Alabama 1975.

PROVIDED, further, that said Principal and Surety hereby agree and bind themselves to the mode of service described in Chapter 1, Title 39, Code of Alabama 1975, and consent that such service shall be the same as personal service on said Principal or Surety.

		PRINCI	PAL			
Signa	ature(s)	1. (Seal)	2.	(Seal)	Corporate	
Name Title (Typ					Seal	
		CORPORATE SU	URETY(IES)			
75	Name & Address (Typed)		State of Inc.	Liability Limit	/	
Surety A	Signature(s)	1.	2.		Corporat Seal	
92	Name(s) & Title(s) (Typed)	1.	2.			
- 69	Name & Address (Typed)		State of Inc.	Liability Limit		
Surety B	Signature(s)	1.	2.	A500 v	Corporate Seal	
	Name(s) & Title(s) (Typed)	1.	2.			

### INSTRUCTIONS

- This form, for the protection of persons supplying labor and material, shall be used whenever a
  payment bond is required under the act of Aug 24, 1935, 49 Stat. 793, as amended (40 U.S.C.
  270a-270e). There shall be no deviation from this form without approval by the Armory
  Commission of Alabama.
- 2. The full legal name and business address of the Principal shall be inserted on the space designated "Principal" on this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g. an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.
- 3. Corporations executing the bond as sureties must be licensed to do business in the State of Alabama. Where more than a single corporate surety is involved, their names and addresses (city and state) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)", and in the space of the Sureties shall be inserted. Evidence of authority must be attached.
- Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal".
- 5. The name of each person signing this payment bond should be typed in the space provided.

### **END OF SECTION**

PAYMENT BOND FORM

### **CONTRACTORS PERIODICAL REQUEST FOR PARTIAL PAYMENT (Rev 12 MAR 2019)**

PROJECT TITLE:	LOCATION:			
CONTRACT NUMBER:				
OWNER: THE ARMORY COMMISSION OF ALABAMA, P.O. BOX				
CONTRACTOR:				
ADDRESS:				
FEDERAL IDENTIFICATION NUMBER:		E DATE:		
PARTIAL PAYMENT NO. FINAL Pay Req? Yes		D 001/EDED		
Item # Description	Contract Price	Percent Complete	Amount Complete	
1				
2				
3				
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32				
33				
34				
35				
TOTAL ORIGINAL CONTRACT	\$0.00		\$0.00	
Net Total of ALL				
Change Orders/Supplements No. to				
TOTAL CONTRACT TO DATE	\$0.00		\$0.00	

Page: \_\_1\_\_ of \_\_2\_

Brought Forward TOTAL CONTRACT TO DATE \$ 0.00		ı			\$0.00
	% Cor	mpleted			
Stored Materials: (List)					
Amount of Stored Materials (*)		\$0.00			\$0.00
Total Completed & Stored Materials					\$0.00
Less Retainage (5% up to 50% of Contract Amount)					\$0.00
Total Due					\$0.00
Total Previous Payments					
BALANCE DUE THIS PAYMENT					\$0.00
BALLANGE BOE THIS FARMENT					Ψ0.00
+ A - A - A - A - A - A - A - A - A - A	de deste déces Dessions Otro				
* As stored materials are incorporated in the finished work, their value shall be	deducted from Previous Stor	ed Materials.			
I certify that the above account is correct, just and that payment therefore has	not yet been received.				
Sworn to and subscribed before me this					
day of 20		CONTRACTOR			
(Do NOT Type Above Information - Handwritten Date Info ONLY)					
ВУ	<i>.</i> .				
(Notary Public)		(Signature)			
Print	ed Name:				
My Commission Expires:	Title:				
VERIFICATIONS AND APPROVALS					
Checked by:	Date:				
Architect/Architect's Representative					
Reviewed by:	Date:				
Project Manager					
America di bor	Data				
Approved by:  Contracting Officer/Contracting Officer's Representative	Date:				
		D	•		2
(Rev 12 MAR 2019)		Page:	2	of	2

### FOR PARTIAL PAY REQUEST NO.

CO#	Description	Contract Price	Percent Complete	Amount Complete
NI.	t Total of ALL Change			
Orders	t Total of ALL Change s/Contract Mods FROM # TO #	\$0.00		\$0.00

Page: 1 of 1



## THE ARMORY COMMISSION OF ALABAMA

P.O. Box 3711 MONTGOMERY, ALABAMA 36109-0711

State Property and Disbursing Office

May 27, 2014

MEMORANDUM FOR ALL Architect-Engineer Firms Preparing Bid Documents for Armory Commission of Alabama and ALL Project Managers

SUBJECT: Act 2013-205, Certificate of Exemption from Sales and Use Tax for Armory Commission Contracts

- 1. Act 2013-205 was signed into law on May 9,2013, granting the Alabama Department of Revenue (ADOR) the authority to issue certificates of exemption from sales and use taxes for construction projects for certain governmental agencies. Enclosed are a Memo from Alabama Department of Revenue regarding the Sales Tax Exemption guidance and a copy of Act 2013-205.
- 2. A brief summary of Act 2013-205 as it pertains to Armory Commission Contracts is provided below:
  - a. ADOR shall issue certificates of exemption from sales and use tax to The Armory Commission of Alabama for each tax exempt project. The Armory Commission shall apply for certificates of exemption for each project. The contractor must also apply for certificates of exemption for each project for which they receive a contract.
  - b. Certificates of exemption shall only be issued for contracts entered into (awarded) on or after 1JAN14.
  - c. Certificates shall only be issued to contractors licensed by the State Licensing Board for General Contractors or any subcontractor working under the same contract.
  - d. Items eligible for exemption from sales and use tax are building materials, construction materials and supplies and other tangible personal property that become part of the structure per the written construction contract.
  - e. ADOR will handle the administration of certificates of exemption and the accounting of exempt purchases. ADOR will have the ability to levy fines and may bar the issuance or use of certificates of exemption upon determination of willful misuse by the contractor or a subcontractor.
  - f. The contractor shall account for the tax savings on the bid form by providing the estimated sales taxes for each item in the appropriate area on the bid form.
- 3. Contractors will NOT include sales taxes in their bids on the bid proposal form. Contractors <u>MUST</u> however include the estimated sales taxes for each listed bid item in the area identified on their bid proposal forms. This "accounting" for sales tax on the bid proposal form is required by Act 2013-205, Section 1 (g). Bid proposal forms with base bids and separate alternate bids will follow this procedure. The bid forms shall be modified for each project by the architect or engineer as appropriate to insure that EACH bid item is listed with NO sales taxes and then a separate area identifying the

estimated sales taxes for EACH of these items is identified and listed on the bid proposal form.

- 4. Failure of the contractor to complete the attachment to the bid proposal form indicating the sales tax as required by Act 2013-205, Section 1 (g) shall render the bid non-responsive.
- 5. Architects will address these tax reporting requirements in all future pre-bid conferences and will further prepare addenda which will inform all current plan holders of this tax exemption policy for the upcoming bid openings in June 2014.
- 6. It is the responsibility of the "contractor" to ensure they comply with Act 2013-205.
- 7. All future projects will include this information in the Instructions to Bidders. Should you have additional questions or need further information, please contact me by email mark.a.weeks3.nfg@mail.mil or phone (334) 271-7275.

Respectfully,

Enclosures

MARK A. WEEKS
Contracting Officer and Secretary,
The Armory Commission of Alabama

SALES TAX ABATEMENT 00 62 77 – 2



## State of Alabama Department of Revenue

(www.revenue.alabama.gov) 50 North Ripley Street Montgomery, Alabama 36132 MICHAEL E. MASON
Assistant Commissioner

JOE W. GARRETT, JR.
Deputy Commissioner

CURTIS E. STEWART

# Alabama Department of Revenue NOTICE

### Tax Guidance for Contractors, Subcontractors and Alabama Governmental Entities Regarding Construction-related Contracts

Legislative Act 2013-205 requires the Department of Revenue to issue Form STC-1, *Sales and Use Tax Certificate of Exemption for Government Entity Projects*, to all contractors and subcontractors working on qualifying governmental entity projects once the Form ST: EXC-01 is approved.

Each exempt entity, contractor and subcontractor must make application for qualification of the exemption using Form ST: EXC-01 for each tax-exempt project. The application is available on the department's website at <a href="http://revenue.alabama.gov/salestax/ST-EXC-01.pdf">http://revenue.alabama.gov/salestax/ST-EXC-01.pdf</a>. Applications should be submitted directly to the Sales and Use Tax Division Central Office, P.O Box 327710, Montgomery, AL 36132-7710.

The sales and use tax exemption provided for in Act 2013-205 applies to the purchase of building materials, construction materials and supplies, and other tangible personal property that become part of the structure pursuant to a qualifying contract entered into on or after January 1, 2014. Qualifying projects and contracts are those generally entered into with the following governmental entities, unless otherwise noted: the State of Alabama, a county or incorporated municipality of Alabama, an Alabama public school, or an Alabama industrial or economic development board or authority already exempt from sales and use taxes. **Please note that contracts entered into with the federal government and contracts pertaining to highway, road, or bridge construction or repair do not qualify for the exemption provided for in Act 2013-205**. [Reference: Sales and Use Tax Division Administrative Rule 810-6-3-.77 Exemption for Certain Purchases by Contractors and Subcontractors in Conjunction with Construction Contracts with Certain Governmental Entities.]

The Alabama Department of Revenue will assign each contractor and sub-contractor a consumers use tax account, if one is currently not in place, at the time the Form STC-1, Sales and Use Tax Certificate of Exemption for Government Entity Projects, is issued.

Contractors and sub-contractors for qualifying projects will be required to file monthly consumers use tax returns and report all exempt purchases for ongoing projects, as well as all taxable purchases on one return. These returns are required to be filed through the department's online tax return filing and payment portal, My Alabama Taxes (<a href="https://myalabamataxes.alabama.gov">https://myalabamataxes.alabama.gov</a>).

As another option for these types of contracts, as well as with other contracts entered into with other types of exempt entities, the Form ST:PAA1, *Purchasing Agent Appointment*, may be used. However, please be advised that the use of the Form ST:PAA1 option will require the exempt entity to be invoiced directly and pay for directly from their funds any construction and building material and supply purchases.

For additional information concerning this guidance, taxpayers should contact Sales and Use Tax Division representative Thomas Sims at 334-242-1574 or by email at <a href="mailto:Thomas.Sims@revenue.alabama.gov">Thomas.Sims@revenue.alabama.gov</a>.

# ACT 2013 - 205

- 1 HB419
- 2 150466-6
- 3 By Representative DeMarco
- 4 RFD: Ways and Means Education
- 5 First Read: 07-MAR-13



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### ENROLLED, An Act,

Relating to construction projects of the State of Alabama, counties, municipalities, local boards of education, industrial development boards, and other governmental entities which are exempt from the payment of sales and use taxes on the purchase of building materials and construction materials to be included in construction projects of the governmental entity; to provide for the Department of Revenue to grant certificates of exemption from sales and use taxes to contractors and subcontractors licensed by the State Licensing Board for General Contractors for the purchase of building materials and construction materials to be used in the construction of a building or other project for the governmental entity, with the exception of any highway, road, or bridge project; to provide for accounting for purchases and enforcement for violation of the act; and to authorize the Department of Revenue to adopt rules to implement the act. BE IT ENACTED BY THE LEGISLATURE OF ALABAMA:

Section 1. (a) For the purposes of this act, the term "governmental entity" means any governmental entity or a political subdivision, department, or agency of a governmental entity or a board, commission, or authority of a governmental entity which is tax exempt from sales and use taxes by virtue of its governmental status, including, but not limited to, all

1	of the following: The State of Alabama, a county, a
2	municipality, an industrial or economic development board or
3	authority, and an educational institution of any of the
4	foregoing including a public college or university, a county
5	term "governmental entity" means the State of Alabama and its
6	political subdivisions, including a county, a municipality,
7	and an industrial or economic development board or authority.
8	A governmental entity shall also include an educational
9	institution of any of the foregoing Alabama political
10	subdivisions including a public college or university, a
11	county or city board of education, and the State Board of
12	Education.
13	(b) (1) The Department of Revenue shall issue a
14	certificate of exemption to the governmental entity for each
15	tax exempt project.
16	(b) (2) The Department of Revenue shall grant a
17	certificate of exemption from state and local sales and use

(b) (2) The Department of Revenue shall grant a certificate of exemption from state and local sales and use taxes to any contractor licensed by the State Licensing Board for General Contractors, or any subcontractor working under the same contract, for the purchase of building materials, construction materials and supplies, and other tangible personal property that becomes part of the structure that is the subject of a written contract for the construction of a building or other project, not to include any contract for the construction of any highway, road, or bridge, for and on

behalf of a governmental entity which is exempt from the
payment of sales and use taxes.

- (c) The use of a certificate of exemption for the purchase of tangible personal property pursuant to this section shall include only tangible personal property that becomes part of the structure that is the subject of the construction contract. Any contractor or subcontractor purchasing any tangible personal property pursuant to a certificate of exemption shall maintain an accurate cost accounting of the purchase and use of the property in the construction of the project.
- (d) A contractor who has an exemption from sales and use tax for the purchase of materials to use on a government project shall file, in a manner as prescribed by the department, an annual report reports of all exempt purchases. The annual report reports shall be filed as a prerequisite to renewal of a certificate of exemption.
- (e) (1) The department may assess any contractor or subcontractor with state and local sales or use taxes on any item purchased with a certificate of exemption not properly accounted for and reported as required.
- (2) Any contractor or subcontractor who intentionally uses a certificate of exemption in violation of this act shall, in addition to the actual sales or use tax liability due, be subject to a civil penalty levied by the

**HB419** 

department in the amount of not less than a minimum of two
thousand dollars (\$2,000) or two times any state and local
sales or use tax due for the property and, based on the
contractor's or subcontractor's willful misuse of the
certificate of exemption, may be barred from the use of any
certificate of exemption on any project for up to two years.

- (f) The department may adopt rules to implement this act in order to effectuate the purposes of this act and to provide for accurate accounting and enforcement of this act.
- (g) In bidding the work on a tax exempt project, the bid form shall provide for an accounting for the tax savings.
- (h) The intent of this act is to lower the administrative cost for the governmental entity, contractor, and subcontractor for public works projects. It is not the intent of this act to change the basis for determining professional services from fair market value, which may include sales and use taxes.

Section 2. This act shall be operative for contracts entered into October 1, 2013 January 1, 2014, or thereafter, and shall not apply to any contract entered into prior to January 1, 2014. In addition, this act shall not apply to any contract change orders or contract extensions, including revised, renegotiated, or altered contracts, when the original contract was entered into prior to January 1, 2014. The

### HB419

1	Department of Revenue may adopt rules to implement this act
2	after the effective date of this act.
3	Section 3. All laws or parts of laws which conflict
4	with this act are repealed.
5	Section 4. This act shall become effective October
6	1, 2013, following its passage and approval by the Governor,
7	or its otherwise becoming law.

1			
2			
3			
4		Speaker of the House of Re	presentatives
		111	
5		Kay I vey	
6	P	resident and Presiding Offi	cer of the Senate
7		House of Representati	ves
8 9 L0	I h and was passe	ereby certify that the with d by the House 09-APR-13, a	in Act originated in s amended.
11 12 13		Jeff Wooda Clerk	rd
4	<u>-</u>		
15	Senate _	07-MAY-13	Amended and Passed
6	Ноисе	00-M7V-13	Concurred in Sen-

09-MAY-13

APPROVED TIME

Alabama Secretary Of State

ate Amendment

Act Num...: 2013-205 Bill Num...: H-419

09:48amSLF Recv'd 05/10/13

Page 6

16

17

House

SECTION C OF ACT NO. 81-889 HEREBY CERTIFY THAT THE RESOLUTION AS REQUIRED IN

I HEREBY CERTIFY THAT THE NOTICE & PROOF IS ATTACHED AS REQUIRED IN THE GENERAL ACTS OF ALABAMA, 1975 ACT NO. TO THE BILL, H.B.

JEFF WOODARD, Clerk

CONFERENCE COMMITTEE

House Conferees

I hereby certify that the Resolution as required in Section C of Act No. 81-889 was adopted and is attached to the Bill, HB

YEAS

NAYS

PATRICK HARRIS, Secretary

HOUSE ACTION

207

SENATE ACTION

11-1

DATE:

**RD 1 RFD** 

WAS ADOPTED AND IS ATTACHED TO THE BILL, H.B. 419

NAYS 6 YEAS OH

This Bill was referred to the Standing

Committee of the Senate on

and was acted upon by such Committee in session and is by order of the Committee returned therefrom with a favorable report by a vote of

qns/m

w/amend(s)

abstain (

nays

yeas

Chairperson

20 13

JEFF WOODARD, Clerk

RD 2 CAL DATE: RF

20\_\_\_

RE-COMMITTED

RE-REFERRED

DATE

Committee

# 00 62 78 INVENTORY OF STORED MATERIALS

# INVENTORY OF STORED MATERIALS

拓	MATERIALS PRESENTLY STORED		
H	MATERIALS USED THIS PERIOD		
D	TOTAL COLUMNS B+C		
C	PURCHASED THIS PERIOD		
В	MATERIALS STORED LAST PERIOD		
A	DESCRIPTION		
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To be used as documentation to support value of Stored Materials reported on CONTRACTOR'S PERIODICAL REQUEST FOR PARTIAL PAYMENT.

Page of

### 00 62 83 CONTRACTOR'S DRAW SCHEDULE

	Date Prepared:
Project Name:	-
Contract Number:	-
Contractor:	
Architect/Engineer:	

This draw schedule is to be updated monthly and the most current version <u>MUST</u> be submitted with each Contractor's Periodical Request for Partial Payment.

CURRENT MONTH/YEAR						
PROJECTED DRAW						
ACTUAL DRAW						
TOTAL AMOUNT OF DRAWS	0	0	0	0	0	0
CURRENT MONTH/YEAR						
PROJECTED DRAW						
ACTUAL DRAW						
TOTAL AMOUNT OF DRAWS	0	0	0	0	0	0
CURRENT MONTH/YEAR						
PROJECTED DRAW						
ACTUAL DRAW						
TOTAL AMOUNT OF DRAWS	0	0	0	0	0	0
CURRENT MONTH/YEAR						
PROJECTED DRAW				_		
ACTUAL DRAW						
TOTAL AMOUNT OF DRAWS	0	0	0	0	0	0

# 00 63 56 – WEATHER DELAY DOCUMENTATION FORM (Revised 3 August 2021)

To:

PWBA Architects, Inc. 529 S Perry St, Ste 15 Montgomery, AL 36104 Phone: 334-244-4990 Fax: 334-244-4971					Contractor Name Contractor Address Contractor City, State Zip Contractor Phone Contractor Fax							
PROJE (Name addre	e and	UTE			<b>TORATIC</b> ma	ON	CONT	RACT NC	).	AC-XX-	C-XXXX-S	
TO OWNER: Armory Commission of (Name and address)  Armory Commission of Alabama 1720 Cong. W. L Dickinson Dr. Montgomery, Alabama 36109		DATE OF ISSUANCE:										
	E OF W			S: DF <u>20</u>	(Year):							
								ne refere ontract Ti		roject in	order to fo	ormally
exterio locatio	or work on for th	and is b ne Proje	ased u ct.	pon Na	tional W	eathe	r Servic	e Clima	tologica		ict period or the gec	
MONT	HLY AN	TICIPAT	ED ADV	ERSE RA	JN (in do	ays) – (	CALEN	DAR DAY	/S			
JAN 5	FEB 6	MAR 5	APR 3	MAY 2	JUN 4	JUL 2	AUG 2	SEP 2	OCT 3	NOV 4	DEC 4	
				_				f this Proj (d		e monthl	y anticipa	ted
Project work. this Pro	t experi	enced al numb e for thi	day: per of a s month	s of adv dverse on by c	erse wed	ather i da	esultin ys exce	g in a po eeds the	artial or o normal	complet adverse	ned that t e stoppag weather ne Contra	je of days at
TOTAL	NET DA	YS REQ	UESTED	FOR	(Mc	onth) (	OF <u>20</u>	(Year)				
TOTAL	NET DA	YS REQ	UESTED	FOR PR	OJECT TO	O DAT	E:	_ (Days)				
TOTAL	NET DA	YS APP	ROVED	BY OWI	NER FOR	PROJ	ECT TO	DATE: _	(□	Days)		
	-	-							_	-	course of t ject in a ti	

From:

**END OF SECTION** 

manner and as scheduled.

# FORM OF ADVERTISEMENT OF COMPLETION

# **LEGAL NOTICE**

In accordance with Chapter	r 1, Title 39, Code of Alabama,
1975, notice is hereby given that	t <u>Contractor</u> has completed
the Contract for Project	Name),
located at <u>City, State</u> , for t	the Armory Commission of Alabama,
Owner, and have made request for f	inal settlement of said Contract. All
persons having any claim for	labor, materials or otherwise in
connection with this project shou	ld immediately notify the Armory
Commission of Alabama, P.O.	Box 3711, Montgomery, Alabama
36109-0711.	
	Contractor
	<b>Business Address</b>

NOTE: This notice must be run once a week for four successive weeks. Proof of publication is required.

# **CERTIFICATE OF PUBLICATION**

# **STATE OF ALABAMA**

COUNTY OF		
Before me,		, a Notary Public, in
and for said County, personally appeared		
who duly sworn, deposes and says that he	e/she is the <b>PUBLISHEF</b>	R of the
·	a newspaper published	d weekly in
Cour	nty, Alabama, and that	the
- <del></del>		
a copy of which is attached hereto, was publis	shed in said newspaper f	or consecutive weeks
commencing in the issue of		(date), and ending in the issue of
	(date).	
	Publi	sher
Sworn to and subscribed before me this	day of	
	Nota	ry Public



# Contractor's Affidavit of Payment of Debts and Claims

PRO	JECT: (Name and address)	ARCHITECT'S PROJEC	OWNER:  ARCHITECT:		
TO OWNER: (Name and address)  CONTRACT FOR CONTRACT DAT			FOR: General Construction CONTRACT		
	E OF: NTY OF:				
other for al the p	wise been satisfied for all mate l known indebtedness and clai	erials and equipment furn ms against the Contractor	payment has been made in ful ished, for all work, labor, and s for damages arising in any ma the Owner or Owner's property	services performed, and anner in connection with	
EXCE	PTIONS:				
1.	Consent of Surety to Final Surety is involved, Consent required. AIA Document Surety, may be used for thate Attachment	Payment. Whenever at of Surety is G707, Consent of	CONTRACTOR: (Name an	d address)	
			BY:		
	ollowing supporting document oif required by the Owner:	s should be attached	(Signature of autho	orized representative)	
1.	Contractor's Release or W conditional upon receipt of		(Printed name and	title)	
2.	Separate Releases or Waiv Subcontractors and materia suppliers, to the extent req accompanied by a list there	al and equipment uired by the Owner,	Subscribed and sworn to b	before me on this date:	
2.1			Notary Public:		
3.	Contractor's Affidavit of F (AIA Document G706A).	Release of Liens	My Commission Expires:		

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User Notes: (1967998544)



# Contractor's Affidavit of Release of Liens

PROJECT: (Name and address)		ARCHITECT'S PRO	JECT NUMBE	ER: OWNER:	
TO OWNER: (Name and address)		CONTRACT FOR: (	General	ARCHITECT: □	
		Construction		CONTRACTOR: □	
		CONTRACT DATE	D:	SURETY:	
				OTHER:	
	E OF: NTY OF:				
of ma	l below, the Releases or Waivers aterials and equipment, and all p	of Lien attached hereto erformers of Work, labo ens or encumbrances ag	o include the or or services	wledge, information and belief, except as Contractor, all Subcontractors, all suppliers who have or may have liens or perty of the Owner arising in any manner	
EXCE	PTIONS:				
SUPI	PORTING DOCUMENTS ATT	ACHED HERETO:	CONTRA	CTOR: (Name and address)	
1.	Contractor's Release or Wai conditional upon receipt of f				
2.	Separate Releases or Waiver		BY:		
	Subcontractors and material suppliers, to the extent requi accompanied by a list thereo	red by the Owner,		(Signature of authorized representative)	
				(Printed name and title)	
			Subscrib	ed and sworn to before me on this date:	
			Notary P	ublic:	
			My Commission Expires:		



# Consent Of Surety to Final Payment

PROJECT: (Name and address)	ARCHITECT'S PROJECT NUMBER:	OWNER:
	CONTRACT FOR: General Construction	ARCHITECT: [
TO OWNER: (Name and address)	CONTRACT DATED:	CONTRACTOR: [
TO OWNER. (Name and address)	CONTRACT DATED.	SURETY: [
		OTHER: [
In accordance with the provisions of the (Insert name and address of Surety)	Contract between the Owner and the Contractor as indicated	above, the
		, SURETY,
on bond of (Insert name and address of Contractor)		
hereby approves of the final payment to Surety of any of its obligations to (Insert name and address of Owner)	the Contractor, and agrees that final payment to the Contractor	, CONTRACTOR, or shall not relieve the
as set forth in said Surety's bond.		, OWNER,
IN WITNESS WHEREOF, the Surety ha (Insert in writing the month followed by		
	(Surety)	<del></del> ;
	(Signature of authorized rep	presentative)
Attest:	(Driver June 1991)	
(Seal):	(Printed name and title)	

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User Notes: (1852984675)

# 00 65 20 - CERTIFICATE OF FINAL COMPLETION FORM

CERTIFICATE OF I	FINAL COMPLETION	Distribution	Distribution to:			
A/E Name A/E Address A/E City, State Zip A/E Phone A/E Fax		OWNER ARCHITECT CONTRACT OTHER	<b>==</b>			
PROJECT: (Name and address)	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	IFB PROJECT NO.	AC- <mark>XX</mark> -C- <mark>XXXX</mark> -S			
TO OWNER: (Name and address)	Armory Commission of Alabama 1720 Cong. W. L Dickinson Dr. Montgomery, Alabama 36109	TO CONTRACTOR: (Name and address)	XXXXXXXXXXXXXXX XXXXXXXXXXXXXX XXXXXXXX			
DATE OF ISSUANCE:	DATE	CONTRACT TYPE: CONTRACT DATE:	General Construction MONTH DAY, YEAR			
PROJECT OR DESIGNATED PORTION SHALL INCLUDE:  BRIEF PROJECT DESCRIPTION.						
The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be complete. Final Completion is the stage in the progress of the Work when the Work or designated portion thereof is complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. The Date of Final Completion of the Project designated above is hereby established as the date of execution by the Owner as stated in the General Conditions, which is also the date of commencement of applicable warranties required by the Contract Documents.						
The project is hereby certified by the Architect as completed.						
A/E Name Architect:	By: NAME		Date:			
Contractor Nam						
Contractor:	By: <mark>NAME (F</mark>	ROM CONTRACT)	Date:			
The Owner accepts the Work as complete and will assume full possession thereof at TIME on DATE.  Armory Commission of Alabama						
Owner:		esentative Name	Date:			
-	= J:					

GENERAL CONTRACTOR'S	B. C. Project No.
ROOFING GUARANTEE	

Project Name & Address	Project Ow	vner(s) & Address
	T 1 1 N 1	
General Contractor's Name, Address, &	Telephone Number	EFFECTIVE DATES
		OF GUARANTEE
		Date of Acceptance:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturer's recommendations.

Date of Expiration:

- 2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.
- 3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

- A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
- B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.
- C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
- D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
- E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN	WITNESS	THEREOF, 20_	this instrun	nent has be	een duly	executed	this	 day o
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	General Co	ontractor's A	uthorized Sig	nature				
					_			
	Ty	ped Name an	nd Title					

# GENERAL CONDITIONS OF THE CONTRACT

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#### CONTRACT DOCUMENTS:

The Contract consists of the following CONTRACT DOCUMENTS, including all additions, deletions, and modifications incorporated therein before the execution of the Contract Agreement:

#### A. STATUTORY AND PROCEDURAL DOCUMENTS:

- (1) Advertisement for Bids (Invitation for Bids)
- (2) Instructions to Bidders (Information for Bidders)
- (3) Proposal (Bid)
- (4) Proposal Guaranty (Bidder's Bond)
- (5) Contract Agreement
- (6) Contract Bonds (Performance and Payment Bonds)
- B. GENERAL CONDITIONS OF THE CONTRACT
- C. DETAILED SPECIFICATION REQUIREMENTS
- D. DRAWINGS
- 2. DEFINITIONS, INTENT, CORRELATION, AND STREAMLINING:

#### A. DEFINITIONS:

Wherever the following abbreviations and terms, or pronouns in place of them, are used in the Contract Documents, the intent and meaning shall be interpreted as follows:

- (1) ARCHITECT: The architect, architectural firm, association, or corporation employed by the Owner, or, in case of the termination of his employment, his successor designated by the Owner, to furnish the working drawings and specifications in the Contract Documents, to prepare the Contract Documents, prepare details and explanatory drawings, and provide architectural instructions necessary for the execution of the Work, and to check and approve manufacturers' data and shop drawings and when so provided in his contract, to exercise general administration of the Contract under the direction of the Contracting Officer.
- (2) BIDDER: The person, or persons, firm, partnership, association, corporation, or combination thereof, submitting a Bid for the Work, or any portion thereof, acting directly or through a duly authorized representative.
- (3) COMMISSION: The Armory Commission of Alabama or any agency that may be designated by the Legislature as its successor.
- (4) CONTRACT AGREEMENT: The written Contract Agreement executed between the Owner and the successful Bidder, covering the performance of the Work, by which the Contractor is bound to perform the Work and furnish the labor, materials and equipment under the terms of the Contract Documents, and by which the Owner is obligated to compensate him therefor at the mutually established and accepted rate or price, or as hereinafter provided.
- (5) CONTRACT BONDS: The approved bonds furnished by the Contractor and his Surety to guarantee both completion of the Contract in accordance with the Contract Documents and prompt payment to all persons supplying him or them with labor, materials, supplies, etc.
- (6) CONTRACTOR: The person or persons, firm, partnership, association or corporation, or combination thereof, that has entered into a Contract with the Owner for any work covered by the Contract Documents, acting directly or through his agents or employees.
- (7) CONTRACTING OFFICER: The Contracting Officer of the Armory Commission, acting either upon his own initiative or through duly authorized representatives and inspectors, acting severally within the scope of the particular duties entrusted to them or the authority given them.
- (8) MODIFICATIONS OF THE GENERAL CONDITIONS: Changes or modifications of the parts of the Armory Commission's Contract General Conditions.

- (9) NOTICE TO PROCEED: A proceed order issued by the Contracting Officer after final execution of the Contract fixing the time within which the Contractor shall begin the prosecution of the Work.
  - (10) OWNER: The State of Alabama acting by and through the Armory Commission.
- (11) BID: The written offer for the Work contemplated, when prepared and submitted by the Bidder in the required manner on the prescribed Bid Form, properly signed and guaranteed.
- (12) SPECIAL CONDITIONS: Additional special or general requirements that are necessary and peculiar to the particular project and which are not included in the parts of the Armory Commission's standard General Conditions.
- (13) SPECIFICATIONS: The general term comprising the Statutory and Procedural Documents, General Conditions of the Contract, the Detailed Standard and Project Specification requirements, together with all modifications thereof and all Addenda thereto.
- (14) SUBCONTRACTOR: Any properly qualified individual, firm, association, or corporation undertaking the performance of any part of the Work under the terms of the Contract Documents by virtue of an agreement between himself and the Contractor with the written approval of the Contracting Officer.
- (15) SURETY: The corporate body, licensed under the laws of Alabama, bound with and for the Contractor for the full and complete performance of the Contract and also for the payment of all claims recoverable under the Contract Bonds.
- (16) THE PROJECT: The total construction designed by the Architect of which the Work performed under the Contract Documents may be the whole or a part.
- (17) THE WORK: The Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.
- (18) USPFO: The United States Property & Fiscal Officer. The USPFO is the State of Alabama representative for the National Guard Bureau, Washington, D.C., an agency of the United States Department of Defense.

#### B. INTENT:

The intent of the Contract Documents is to include all labor, materials, water, fuel, tools, plants, utility, and transportation services, and all other incidental services and expenses necessary or required for proper execution and completion of the work.

#### C. CORRELATION:

- (1) ORDER OF PRECEDENCE: Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given the same in the following order:
  - (a) The Contract Agreement
  - (b) The Detailed Specification Requirements
  - (c) Details appearing on the Drawings
  - (d) The Working Drawings
- (2) WORDS AND TERMS: Words used in the documents will be given their usual and common meaning unless from the entire Contract it is clear that some other meaning was intended. Words describing material or work which have a well known technical meaning or trade meaning unless specifically defined in the Contract Documents, will be construed in accordance with such well known meaning recognized by architects, engineers, and the trades. Technical terms will be construed in a technical sense, and a specially widely adopted trade meaning afforded certain terminology will be taken into account in any interpretation containing such terminology.

- (3) GENERAL AND SPECIAL CONDITIONS: Where both General and Special Conditions relate to the same thing, the Special will prevail; that is, the specific language will take precedence over the more general wording. However, where both the General and Special Conditions may be given reasonable effect, both are to be retained.
- (4) PRINTING, TYPING, AND WRITING: When a printed portion of the Contract Documents cannot be reconciled with a typewritten portion, the latter will prevail. Various types of duplicating processes will be considered typewriting instead of printing. Also, if one is typewritten and the other written in longhand, the one written in longhand will govern. Likewise, written numbers will govern.

Written specifications will take precedence over drawings. If a correction is made in specifications or on a drawing and the original conflicting statement is not crossed out, then the revision, written in or drawn in, will be considered what was meant.

Obvious clerical or drafting errors or omissions revealed by perusal of the Contract Documents as a whole will be discounted in determining the intent of the parties, insofar as this may be accomplished without contravention of legal principles or public policy.

- (5) DRAWINGS AND SPECIFICATIONS: The intent of the Specifications is to outline or indicate items of work on both, that cannot readily be shown on the Drawings and, further, to indicate types and qualities of materials and workmanship. Drawings and Specifications will be considered complimentary, and items of work mentioned or indicated on one and not on the other shall be included as if mentioned in both, except items definitely noted "Not in Contract" or marked "N.I.C."
- (6) CONTRACTOR'S CHECK: Prior to the execution of the Work, the Contractor shall check the Drawings and Specifications and shall immediately report all errors, discrepancies, and/or omissions discovered therein by letter to the Architect with a copy to the Contracting Officer. All such errors, discrepancies, and/or omissions will be adjusted by the Architect and/or the Contracting Officer, who will notify the Contractor. Any adjustments made by the Contractor without prior approval will be at his own risk and the settlement of any complications arising from such adjustment will be at his own expense.
- (7) EXPLANATIONS: Any doubt as to the meaning of the Specifications, or any obscurity as to the wording of them, will be explained by the Architect and all directions and explanations requisite or necessary to complete, explain or make definite any of the provisions of the Specifications and Drawings and given them due effect, will be given by the Architect in writing.

## D. STREAMLINING:

(1) OMISSION OF WORDS AND PHRASES: The detailed Standard and Project Specifications are of abbreviated or "streamlined" type and include incomplete sentences in order to avoid cumbersome and confusing repetition of expression. Omissions of words or phrases such as "the Contractor shall," "in conformity therewith," "as noted," or "as indicated on the Drawings," "according to the Drawings," are intentional. Omitted words or phrases will be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

Wherever in the Specifications or upon the Drawings, APPROVED, AUTHORIZED, CONTEMPLATED, CONSIDERED NECESSARY, DEEMED NECESSARY, DESIGNATED, DIRECTED, GIVEN, ORDERED, PERMITTED, PRESCRIBED, REQUIRED, or words of like import are used, they shall be construed to mean and intend "by the Contracting Officer;" and, similarly, the words ACCEPTABLE, SATISFACTORY, or words of like import shall be construed to mean acceptable to or satisfactory "to the Contracting Officer," unless otherwise expressly stated or the Contract clearly indicates another meaning.

Words "furnish," "install," "perform," "provide," and "work" shall mean that the Contractor shall furnish, install, perform, provide and connect up complete in operative condition and use all materials, equipment, apparatus, and required appurtenances of the particular item to which it has reference.

(2) APPLICABLE PUBLICATIONS: Reference to standard specifications, associations, bureaus, organizations, or industries, and the like, shall mean the latest edition of such references adopted and published at date of Advertisement for Bids.

#### 3. ADDITIONAL DETAIL DRAWINGS AND INSTRUCTIONS:

Further information and instructions may be issued by the Contracting Officer or prepared by the Architect and transmitted to the Contractor by the Contracting Officer or the Architect, during the progress of the Work by means of additional detail drawings or otherwise as deemed necessary to make more clear or specific the Drawings and Specifications in the Contract Documents, when and as required by the Work. All such drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom.

Any discrepancies found between the Drawings and Specifications and site conditions shall be immediately reported in writing to the Architect who will promptly correct such error or omission in writing. Any work done by the Contractor after his discovery of such discrepancies, errors, or omissions shall be done at his own risk.

In case of differences between small and large scale drawings, the large scale drawings shall govern.

Where on any of the drawings a portion of the Work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other portions of the Work.

Where the word "similar" occurs on the Drawings, it shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection with other parts of the Work.

If the Contractor considers that any work is required in a manner to make it impossible to produce first-class work, or should discrepancies appear among the Contract Documents, the Contractor shall request interpretation before proceeding with such work. If he fails to make such request, no excuse will thereafter be entertained for failure to carry out the work in a satisfactory manner.

#### COPIES FURNISHED CONTRACTOR:

Except as otherwise provided, all required copies of Drawings and Specifications reasonably necessary for the execution of the Work will be furnished to the Contractor by the Architect or Contracting Officer without charge. Other copies requested will be furnished at reproduction cost.

#### 5. SHOP DRAWINGS:

The Contractor shall check the Contract Drawings for accuracy and verify with field measurements as necessary. He shall submit to the Architect, with his criticism and/or approval, all layouts, detail schedules, shop drawings, and setting or erection drawings as required by the Specifications or requested by the Contracting Officer for proper installation of materials, without causing delay in the Work. The Contractor shall check Subcontractors' shop drawings for accuracy and see that work contiguous with and having bearing on work indicated on shop drawings is accurately and distinctly illustrated. Shop drawings shall be dated, numbered consecutively, show working and erection dimensions and necessary details, including complete information for connecting to other work. Any work required by shop drawings that is fabricated by the Contractor prior to approval shall be at his own risk.

All drawings and schedules, accompanied by a letter of transmittal containing project number, number of drawings, titles, or other pertinent data, shall be submitted to the Architect in quintuplicate by the Contractor (with his stamp of approval thereon) sufficiently in advance of construction requirements to allow checking, correcting, resubmitting, and rechecking. A duplicate of said letter, only, shall be mailed simultaneously to the Contracting Officer. If shop drawings show variations from the requirements of the Contract Documents because of standard shop practice or other reasons, specific mention of such variations shall be made in the letter of submittal.

Satisfactory drawings will be so identified, dated, approved, and three copies or sets returned to the Contractor by the Architect. Should shop drawings be disapproved, three sets will be returned to the Contractor by the Architect indicating corrections and changes to be made.

Such corrections, changes, including design and artistic effect, shall be made by the Contractor and bound sets of shop drawing prints shall be submitted in quintuplicate to the Architect until final approval is obtained. No corrections or changes indicated on shop drawings will be considered as Extra Work.

The approval of shop drawings, schedules, and setting drawings will be general and, except in departures found to be in the interest of the Owner and so minor as not to involve a change in the Contract Price or performance time, shall not be construed (1) as permitting any departure from contract requirements; (2) as relieving the Contractor of the responsibility for any error in details, dimensions, or otherwise that may exist in shop drawings or schedules; (3) as approving departures from Drawings and Specifications or from additional details or instructions previously furnished by the Architect, unless he has in writing called attention to such deviations at the time of submission, and secured written approval.

#### 6. PROJECT AND RECORD DOCUMENTS:

The Contractor shall keep on the site of the work in good order, at least one set of his Contract Drawings including shop drawings, Specifications, and all authorized Change Orders, and shall at all times give the Owner, Architect, and their authorized representatives access thereto.

The Contractor shall also keep in his office on the site of the work the two sets of Contract Drawings and Specifications furnished by the Owner, herein referred to as RECORD DRAWINGS, on which shall be recorded all work as built or installed, and such other information as is specified or required. He shall carefully draw and letter notes of explanation, in ink, on both sets of Record Drawings, or furnish two copies of detailed sketches as the Contracting Officer may require, as a fully dimensioned record of all work. The Record Drawings, supplemented by any detailed sketches deemed necessary, shall indicate the Work "AS BUILT". The Contractor will be required to prepare new drawings if the indications on the Record Drawings or the detailed sketches are illegible or otherwise unsatisfactory for future reference. Each record or correction made on such drawings will be initialed and dated by the Supervisor or Inspector.

# 7. OWNERSHIP OF DRAWINGS:

All original or duplicated Drawings and Specifications, and other data prepared by the Architect, and copies thereof prepared and furnished to the Contractor by the Architect are the property of the Armory Commission.

Upon completion of the Work all copies of Drawings and Specifications, with the exception of two sets retained by the Contractor, and two sets of RECORD DRAWINGS, shall be returned by the Contractor to the Architect. The Record Drawings will be delivered by the Architect to the Owner on Completion of the Work.

#### 8. SAMPLES:

The Contractor shall, without undue delay, furnish and submit to the Architect any samples that require the Architect's approval, and also any samples that may be requested by the Contracting Officer, of any and all materials or equipment he proposes to use, and shall prepay all shipping charges on the samples. Samples shall be furnished sufficiently in advance to allow the Architect and/or Contracting Officer reasonable time for examination, investigation, or consideration, without delay to the Work.

The Contractor shall provide Subcontractors and his prospective manufacturers, material dealers or suppliers with complete information of pertinent contract requirements and all transactions therewith shall be through the Contractor.

No materials or equipment of which samples are required to be submitted for approval shall be used on the Work until such approval has been received, save only at the Contractor's risk and expense.

Each sample shall have a label indicating the material represented, its place of origin and the name of the producers, the Contractor, and the building or Work for which the material is intended. Where manufacturer's printed instructions for installations are required, duplicate copies of such directions shall be submitted with samples.

Samples of finished material shall be marked to indicate where the materials represented are required by the Drawings or Specifications.

A letter, submitting each shipment of samples shall be mailed by the Contractor to the Architect containing a list of the samples, the name of the building or Work for which the materials are intended, and the brands of materials and names of the manufacturers.

After a material has been approved by the Architect with the approval of the Contracting Officer, if required, no additional samples of that material will be considered and no change in brand or make will be permitted.

Approved samples of hardware, in good condition, may be suitably marked for identification and used in the Work.

The approval of any sample by the Architect or Contracting Officer will be only for the characteristics or for the uses named in such approval and shall not be construed in itself to change or modify any Contract requirements.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material for use in the Work.

Test samples as the Architect or Contracting Officer may deem necessary, will be produced from the various materials delivered to the Contractor for use in the Work. If any of these test samples fail to meet the specification requirements, any previous approval will be withdrawn and such materials shall be subject to removal and replacement by the Contractor with materials or equipment meeting the specification requirements, the defective materials may be permitted to remain in place subject to proper credit or adjustment of the Contract Price as hereinafter set forth under DEDUCTIONS FOR UNCORRECTED WORK.

The costs of tests will be borne by the Owner except where laboratory tests as hereinafter specified are required by the specifications.

# 9. PROGRESS SCHEDULE AND CHARTS:

The Contractor shall within five days after date of commencement of work, prepare and submit to the Architect for approval, a practicable schedule showing the order in which the Contractor proposes to carry on the Work, the date he will start the several salient features, including procurement of material, plant, and equipment and the contemplated date of completion of same.

The schedule shall be in the form of a conventional Progress Chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall enter on the chart his actual progress, preferably at the end of each week, but in any event at the end of each month, and deliver to the Architect two copies thereof and attach one to his monthly Application for Partial Payment.

If, in the opinion of the Architect or the Contracting Officer, the Contractor falls materially behind his progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Architect or the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, and/or the amount of construction plant, and to submit for approval such supplementary schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Owner.

Failure of the Contractor to comply with the requirements of the Architect or the Contracting Officer as above set forth will be grounds for determination by the Architect or the Contracting Officer that the Contractor is not prosecuting the Work with such diligence as will insure completion within the Contract Time. Upon determination of unreasonable delay, the Owner may terminate the Contractor's right to proceed with the Work, or any separable part thereof.

## 10. MATERIALS, EQUIPMENT, AND EMPLOYEES:

Unless otherwise stipulated, the Contractor shall furnish all material, equipment, tools, labor, water, light, power, transportation, other services or facilities and incidentals for the proper execution and completion of the Work. Unless otherwise stipulated, all materials and equipment incorporated in the Work shall be new.

All labor shall be performed in the best and most workmanlike manner by persons skilled in their respective assignments or trades. Workmen whose work is unsatisfactory to the Architect or the Contracting Officer, or who are considered unfit or unskilled, or otherwise objectionable, shall be dismissed upon notice from the Architect or Contracting Officer.

#### 11. EQUIPMENT AND MATERIAL DEVIATIONS:

Whenever any material or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's names, model numbers, etc., it is intended to establish a required standard of design and quality, and is not intended to limit competition. It shall be expressly understood that the phrase "or approved equal" is hereby inserted following the naming of manufacturers for any material or equipment, whether such phrase occurs in the specifications, or not.

When the specifications and/or drawings indicate only one or two manufacturers' names for material or equipment to be used, the bidder may submit his bid based on material or equipment of manufacturers not named but considered by the bidder to be equal to the standard of design and quality as specified; however, such substitutions must be approved by the Architect. If the bidder elects to bid on a substitution without securing written approval of the Architect prior to receipt of bids, then it will be understood that proof of compliance with specified requirements is the direct responsibility of the bidder and no such material or equipment may be purchased or installed without written approval by the Architect.

When the specifications and/or drawings indicate three or more manufacturers' names for material or equipment to be used, the bids shall be based upon the equipment and material so named, unless the bidder desires to bid on an "approved equal". In case the bidder desires to substitute an "equal" he must secure written approval by the Architect of qualification to bid prior to date for receiving bids. If no request to substitute an "approved equal" is made by the bidder, and approved by the Architect, then it will be expressly understood that all such material and equipment so named or described in the specifications and on the drawings will be furnished in full accordance with the Contract Documents.

# 12. ROYALTIES; PATENTS; AND COPYRIGHTS:

The Contractor shall pay all royalties and license fees. The Contractor shall hold and save the Owner and his agents and employees harmless from liability of any nature or kind, including cost and expenses, for or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner.

If the Contractor has information that any process, article or item specified or delineated by the Architect is an infringement of a patent, or a copyright, he shall promptly give such information to the Architect.

#### 13. SURVEYS, PERMITS, LAWS, AND REGULATIONS:

The Contractor shall provide competent engineering services to execute the Work in accordance with contract requirements. He shall verify the figures given for the contours, approaches and locations shown on the Drawings before undertaking any construction work and be responsible for the accuracy of the finished work. Without extra cost to Owner, he shall engage a licensed surveyor if necessary to verify boundary lines, keep within property lines, and shall be responsible for encroachments on rights or property of public or surrounding property Owners.

The Contractor shall establish all base lines for the location of the principal components of the Work and make all detail surveys necessary for construction, including slope stakes, batter boards and other working points, lines and elevations.

If the Contractor finds any errors or discrepancies, or that any previously established references have been destroyed or misplaced, he shall promptly notify the Architect.

The Contractor shall obtain and pay for all licenses and permits and shall pay all fees and charges for connection to outside service and the use of property, other than the site of the Work, required for the execution and completion of the Work.

The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, and building code requirements applicable to or bearing on the conduct of the Work unless in conflict with Contract requirements. If the Contractor ascertains at any time that any requirement of the Contract is at variance with applicable laws, ordinances, regulations, or building code requirements, he shall promptly notify the Architect, and any necessary adjustment of the Contract will be made as hereinafter specified under CHANGES IN THE WORK.

The Contractor shall pay all applicable Federal, State and local taxes and assessments on the real property of the site of the Work.

Wherever the law of the place of building requires a special sales tax, consumer, use, occupation, or other tax, the Contractor shall pay such tax.

#### 14. PROTECTION OF WORK AND PROPERTY:

The Contractor shall at all times adequately maintain, guard and protect his own work from damage, and safely guard and protect the Owner's property from injury or loss arising in connection with this Contract. He shall make good any such damage, injury or loss, except such as may be directly due to errors in the Contract Documents or caused by agents or employees of the Owner.

He shall adequately protect adjacent property as provided by law and Contract Documents.

Any damage to existing structures, or the interruption of a utility service shall be repaired or restored promptly by and at the expense of the Contractor.

The Contractor shall protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which are not required to be removed or do not unreasonable interfere with construction, as may be determined by the Architect or Contracting Officer, and be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials, on grass areas by equipment.

Care shall be taken by the Contractor in felling trees that are to be removed to avoid any unnecessary damage to vegetation or other trees that are to remain in place. Any limbs or branches unavoidably broken during such operations shall be trimmed with a clean cut and painted with an approved tree priming compound. The Contractor may be required to replace or restore at his own expense all vegetation not protected and preserved, as above required, that may be destroyed or damaged.

The Contractor shall provide and maintain all passageways, guard fences, lights, and other facilities required for protection by state or municipal laws and regulations or local conditions.

The Contractor shall take all necessary precautions for the safety of employees on the Work and shall comply with all applicable provisions of federal, state, and municipal safety laws and building codes to prevent accidents or injury to persons on or about or adjacent to the premises where the Work is being performed. He shall erect and properly maintain at all times, as required by conditions and progress of the Work, all necessary safeguards for the protection of workmen and the public, and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling materials.

Machinery, equipment and all hazards shall be guarded or eliminated in accordance with the latest edition of the Manual of Accident Prevention in Construction of the AGC to the extent that such provisions are not in contravention of applicable laws.

In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor may act, without previous or special instructions from the Architect, or the Contracting Officer, at his discretion; and shall so act, without appeal, if so instructed or authorized by the Architect or the Contracting Officer.

Any compensation claimed by the Contractor as Extra Work on account of emergency work, together with substantiating documents in regard to expense, shall be submitted through the Architect to the Contracting Officer who will determine the amount of compensation.

#### 15. CLIMATIC CONDITIONS:

When so ordered by the Architect or Contracting Officer, the Contractor shall suspend any work that may be subject to damage by climatic conditions.

#### 16. TEMPORARY UTILITIES:

Unless otherwise agreed to by the Owner in writing, the Contractor shall provide all necessary utility services, at his expense, until the job is complete and accepted by the Owner. All utilities services shall include, but not be limited to, the following: electricity; gas; water; sewer; telecommunications; waste (dumpster) disposal, etc.

The Contractor shall provide all utility services as necessary to install and/or test all work and materials, and further to protect and maintain all work and materials against injury or damage from heat or cold and from humidity/dampness. The Contractor shall continue to provide these services, at his expense, until completion and final acceptance by the Owner of all work in the Contract. The Contractor may be relieved of utilities expenses, in whole or part, should the building(s) be fully occupied by the Owner prior to such final acceptance of the work. The Contractor may petition in writing for the Owner to consider this relief of utilities expenses (either partially or wholly) due to this full occupation of the building(s) by the Owner. The Owner must provide a written and signed agreement in order to relieve Contractor of the utilities expenses. Any such date of relief shall be as established in this written agreement.

In the absence of any such written agreement by the Owner, the Contractor shall continue to provide heat and conditioned air as necessary to protect all work and materials against injury from dampness and heat/cold until final acceptance of all work in the Contract as indicated herein.

- A. HEATING: During cold weather or the winter months, the Contractor shall provide heat and weather protection as follows:
- (1) At all times during the placing, setting, and curing period of concrete, sufficient heat to insure the heating of spaces to not less than 50° F. or in accordance with the manufacturer's recommendations.
- (2) From the beginning of the application of plaster and during the setting and curing period, sufficient heat to produce a temperature of not less than 50° F. or in accordance with the manufacturer's recommendations.
- (3) For a period of ten days previous to the placing of interior wood finish work and throughout the placing of wood finish and other interior finishing, varnishing, painting, etc., and until final acceptance of the Work, sufficient heat to produce a temperature of not less than 70° F. or in accordance with the manufacturer's recommendations.
- (4) Provide temporary closures for windows, doors, and all temporary openings and take every reasonable precaution to prevent the escape of warm air from or entrance of cold air into the building. Except as elsewhere called for, the temperature required in the unoccupied spaces will be from 45° F. to 65° F.
- B. VENTILATION and AIR CONDITIONING: During hot weather or the summer months, the Contractor shall provide ventilation and/or air conditioning as required in order to maintain the temperature of the interior of the building(s) between 70° F. and 80° F. The Contractor shall also maintain the humidity level of the interior of the building(s) within the ranges specified in the Contract Documents.
- C. In all cases, Contractor shall be responsible to maintain the appropriate temperature range and humidity levels as is recommended by the manufacturer of all the various building materials, furnishings, equipment, components, systems, etc. to prevent any damage due to heat or cold or humidity.
- D. Unless otherwise agreed to by the Owner in writing, the Contractor shall continue to provide these utility services, at his expense, until the job is complete and accepted by the Owner.

#### 17. INSPECTION OF THE WORK:

The Architect, the Contracting Officer, any Federal or State agency having jurisdiction, and their representatives shall have access at all times to the Work for inspection whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection.

All materials, workmanship, processes of manufacture, and methods of construction, if not otherwise stipulated in the Specifications, shall be subject to inspection, examination, and test by the Architect (or his

duly authorized representative) at any and all places where such manufacture and/or construction are being carried on. The Architect shall have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be satisfactorily corrected, and rejected material shall be satisfactorily replaced with proper material without charge therefor, and the Contractor shall promptly segregate and remove the rejected material from the premises.

The Contracting Officer will appoint or assign architectural and engineering Inspectors, with designated duties and restricted authority, to inspect the Work as he may direct, or to make special inspections requested in advance by the Contractor, and to report to him progress of the Work, and manner of procedure, quality of the material and workmanship, and compliance with the Contract Documents. Inspectors shall have the authority to give directions for the safety and convenience of the public, and concerning the conduct of the Work; to advise the Contractor to avoid his making errors and to expedite his correction of deviations in the Work, to reject materials, workmanship, or equipment clearly defective or otherwise not in accordance with the Drawings and Specifications; but neither the presence nor absence of such Inspectors shall relieve the Contractor from any contract requirement.

Neither the Inspectors, nor the Architect, will be authorized to revoke, alter, relax, or waive, any requirements of the Contract Documents, to finally approve or accept any portion of the Work or to issue instructions contrary to the Drawings and Specifications; nor shall they supervise and direct work for the Contractor, nor unreasonably interfere with the Contractor's operations beyond the extent necessary to make certain that the Work is being carried out according to the contract requirements.

Any advice which they may give the Contractor shall not be construed as binding the Owner or the Contracting Officer in any way, nor as releasing the Contractor from any of the contract requirements.

If the Contractor considers any work demanded of him to be outside the contract requirements, or any record or ruling of the Architect or an Inspector to be unfair, he may immediately, upon such work being demanded or ruling made, request written instructions from the Architect, or Inspector, or within ten days file an appeal with the Contracting Officer, stating clearly and in detail the basis of his objections. However, pending the Contracting Officer's decision on such appeal, no work shall be done in disregard of the rulings of the Architect or Inspector or his instructions on items of work affected by such appeal.

The Contractor shall furnish promptly, without extra compensation, all reasonable facilities, labor, and material necessary for safe and convenient access, inspection, and tests that may be required by the Contracting Officer or the USPFO. All inspections and tests will be performed in such a manner as not to cause unnecessary delay of the work. Special, full size, and performance tests shall be as described in Sections of the Specifications. The Contractor shall be charged any extra cost of inspection incurred by the Owner on account of material and workmanship not being ready at time of inspection set by the Contractor.

Should it be considered necessary or advisable by the Owner, or by the representatives of the Chief, National Guard Bureau, at any time before final acceptance of the entire work to make an examination of work already completed by uncovering, or removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and materials. If such work is found to be defective in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all expense of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract Documents, work of examination and replacement will be considered and compensated for as Extra Work ordered by the Architect or Contracting Officer and, in addition, if completion of the Work has been delayed thereby, an extension of time will be granted for such delay as estimated by the Architect or Contracting Officer. Federal funding support of the cost for examination and replacement of satisfactorily completed work that requires removal or that is damaged due to inspection requirements is subject to prior approval by the Chief, National Guard Bureau, or his dulyauthorized representative.

When the Architect considers the work as nearing completion, or substantially completed, after being notified by the Contractor that the Work is completed, the Architect and the Contracting Officer or his representatives, duly authorized in writing, will inspect all the work included in the Contract Documents. If it is found that the Work has not been satisfactorily completed, the Architect will notify the Contractor, in writing, as to the work to be done or the particular defects to be remedied to place the work in condition satisfactory for acceptance. After the work has been satisfactorily completed, the Architect and the Contracting Officer will make the final inspection or inspections and notify the Contractor in writing when the Work has been finally accepted.

#### 18. SUPERINTENDENCE AND SUPERVISION:

The Contractor shall give his personal superintendence of the Work, using his best skill and personal attention, or have a qualified superintendent, and any necessary assistants acceptable to the Contracting Officer, on the Work at all times during progress, and with full authority to act in his behalf. The Contractor shall not remove a superintendent from the Work who is satisfactory to both him and the Architect, except with the Architect's consent, unless he ceases to be in his employ.

All instructions given the superintendent in the Contractor's absence by the Architect or the Contracting Officer or his representative shall be considered as given the Contractor. In general, the more important verbal instructions will be confirmed in writing to the Contractor; and upon written request of the Contractor, any other instructions will be confirmed in writing.

The Contractor shall carefully study and compare all Drawings, Specifications, other instructions and related data, and at once report in writing to the Architect, with a copy to the Owner, any inconsistency, discrepancy, error, or omission he may discover, for adjustment by the Architect. However, he shall not be liable to the Owner for any damage resulting from any errors or deficiencies in the Contract Documents, except that adjustments made without prior approval will be at his own risk.

#### 19. CHANGES IN THE WORK:

The Owner may at any time make changes in the Work by changes in the Drawings and Specifications of the Contract and within the general scope thereof. Changes will be in the form of a Contract Change Order based upon a written request of the Owner and a written proposal of the Contractor. In making any change, the charge or credit for altering, adding to or deducting from the Work shall be determined by one of the following methods selected by the Owner:

- A. By mutually agreed price or prices which will be added to or deducted from the Contract Price. Additions to the contract price shall include the Contractor's overhead and profit but shall not exceed 15 percent. Where subcontract work is involved, the total mark-up for the Contractor and subcontractors shall not exceed 25%. This percentage allowance for overhead and profit shall include the cost of superintendent, timekeeper, clerks, watchmen, use of small tools, incidental job burdens, and general office expenses. There will be no additional or separate charges for these items. No allowance for overhead and profit shall be figured on any change which involves a net credit to the Owner.
- B. By estimating the number of unit quantities of each part of the Work which is changed and then multiplying the estimated number of such unit quantities by the applicable unit prices, if any, set forth in the Contract, or other mutually agreed unit prices. The percentage and criteria for overhead and profit shall be as detailed in paragraph A above. There will be no additional or separate charges allowed for superintendent, timekeeper, clerks, watchmen, use of small tools, incidental job burdens, and general office expenses.
- C. By ordering the Contractor to proceed with the Work on a cost-plus-percentage-of-the-cost basis and to keep and present in such form as the Contracting Officer will approve, duplicate itemized statements of the cost of the change together with all vouchers therefor, detailed as to the following items:
- (1) Name, classification, date, daily hours, total hours, rate, and extensions for such laborers and pro-rata charges for foreman.
- (2) Designation, dates, daily hours, total hours, rental rates, and extensions for each piece of equipment or power tool actually used.
  - (3) Quantity of each material item actually used and extension.
  - (4) Transportation on materials used.
- (5) Power and all items of cost such as cost of property damage, public liability and workmen's compensation insurance; also social security, old age and unemployment insurance.
- (6) The percentage allowance for the Contractor's overhead and profit shall not exceed a total of 15 percent of the net cost of above items (1), (2), (3), (4) and (5). The percentage allowance for overhead

shall include the cost of bonds, superintendent, timekeeper, clerks, watchmen, use of small tools, incidental job burdens, general office expenses, and insurance other than items listed above in paragraph C(5).

(7) The credits to the Owner for deductive changes shall be the net cost to the Contractor, excluding project overhead and profit.

The Contractor shall furnish to the Owner an itemized breakdown of the quantities and prices to be used in estimating the value of any change that might be ordered.

Federal funding support of any change or extra is subject to prior approval by the Chief, National Guard Bureau, or his/her duly authorized representative.

#### 20. CLAIMS FOR EXTRA COST OR EXTRA WORK:

If the Contractor claims that any instructions, by drawings or otherwise, are not in accordance with the Contract Documents, and involve extra cost under the Contract, he shall give the Architect and the Contracting Officer written notice there of within ten (10) days after receipt of such instructions, and in any event before proceeding to execute the work, and the procedure shall then be as above under 19, CHANGES IN THE WORK. Otherwise no such claim will be considered.

Federal funding support of any change or extra is subject to prior approval by the Chief, National Guard Bureau, or his/her duly authorized representative.

#### 21. DEDUCTIONS FOR UNCORRECTED WORK:

If the Owner deems it expedient to correct work injured or installed at variance with the Contract requirements, the Owner may, if he finds it to be in his interest, allow part or all of such work to remain in place, provided an equitable deduction from the Contract Price is offered by the Contractor and approved by the Contracting Officer.

# 22. DELAYS; EXTENSION OF TIME:

Delays: A delay beyond the Contractor's control at any time in the progress of Work by an act or omission of the Owner or the Architect, or the Contracting Officer or by any other Contractor employed by the Owner, or by strikes, fires, abnormal floods, tornadoes, or other cataclysmic phenomenon of nature, may entitle the Contractor to an extension of time in which to complete the Work as determined by the Contracting Officer provided, however, that the Contractor shall immediately give written notice to the Architect of the cause of such delay.

No such extension shall be made for delays due to rain, wind, flood, or other natural phenomenon of normal intensity for the locality, or for delay occurring more than seven (7) days before written claim therefor is submitted by the Contractor.

Extension of Time: In the event any material changes, alterations or additions are made as herein specified which in the opinion of the Contracting Officer, will require additional time for the execution of any work under the Contract, then, in that case, the time of completion of the Work will be extended by such a period of time as may be fixed by the Contracting Officer, and his decision shall be final and binding upon the Owner and the Contractor, provided that in such case the Contractor within seven (7) days after being notified in writing of such changes, alterations or additions shall request in writing an extension of time, but no extensions of time shall be given for any minor changes, alterations or additions. The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extensions of time required for the execution of the Work. Only claims for compensation that are approved in accordance with the procedures outlined as above in Paragraph 19, CHANGES IN THE WORK and in Paragraph 20, CLAIMS FOR EXTRA COST OR EXTRA WORK and are also approved in writing by the Owner shall be considered. Otherwise no such claims will be considered.

#### 23. CORRECTION OF WORK BEFORE FINAL PAYMENT:

Any defective work, whether the result of poor workmanship, the use of defective materials, damage through carelessness of the Contractor or his employees, or any other cause, shall be removed from the premises within ten (10) days after written notice is given by the Architect, and promptly replaced and re-

executed by the Contractor in accordance with the contract requirements and without expense to the Owner. The Contractor shall also bear the expense of making good all work of the Owner or his other contractors destroyed or damaged by such removal and replacement.

## 24. CORRECTION OF WORK AFTER FINAL PAYMENT:

Verification and approval of the Final Application for Payment and the making of the Final Payment by the Owner shall not relieve the Contractor of responsibility for faulty materials or workmanship. The Owner or the User shall promptly give notice of observed defects due to faulty materials or workmanship, and any damage to other work resulting therefrom, and in accordance with the terms of any special guarantees provided by the Contract, and the Contractor shall promptly replace any such defects discovered within one year from the date of written acceptance of the Work or Final Payment therefor, whichever is prior. All questions arising hereunder, notwithstanding Final Payment, shall be decided by the Contracting Officer.

# 25. OWNER'S RIGHT TO CORRECT DEFICIENCIES:

Upon failure or neglect by the Contractor to properly prosecute, or to perform the Work in accordance with the Contract Documents, including any requirements with respect to the Progress Schedule and/or Charts, and after ten (10) days' written notice to the Contractor by the Contracting Officer, the Owner may, without prejudice to any other remedy he may have, correct such deficiencies and may deduct the actual cost thereof to the Owner from payment then or thereafter due to the Contractor, provided, however, that the Contracting Officer shall approve both such action and the amount charged the Contractor.

#### 26. OWNER'S RIGHT TO TERMINATE CONTRACT:

If the contractor refuses or fails to prosecute the work, or any separate part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, or if the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he should fail to make prompt payment to Subcontractors for material or labor, or disregard laws, ordinances, or the instructions of the Contracting Officer or the Architect, or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon the certificate of the Contracting Officer that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor, and his Surety, ten (10) days' written notice, terminate the employment of the Contractor and take possession of the promises and of all materials, tools, equipment, and appliances thereon and finish the Work by whatever method he may deem expedient. In such cases, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price shall exceed the expense of finishing the work, including compensation for additional architectural, engineering, managerial, and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred though the Contractor's default, shall be certified by the Contracting Officer.

#### 27. CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT:

If the Work should be stopped under an order of any court, or other public authority, for a period of ninety (90) days, through no act or fault of the Contractor or of anyone employed by him, then the Contractor may, upon fourteen (14) days' written notice to the Owner and the Contracting Officer, stop work or terminate this Contract at the Owner(s) will reimburse the Contractor for all work properly executed and any proven loss sustained upon any plant or materials and any other proper item of damage certified by the Contracting Officer.

#### 28. APPLICATIONS FOR PARTIAL AND FINAL PAYMENTS:

The Contractor shall, within ten (10) days after the Notice to Proceed, submit to the Architect on the application for payment form approved or furnished by the Contracting Officer, a complete breakdown or schedule of values of the Contract price showing the value assigned to each of the various parts of the work, including an allowance for overhead and profit, aggregating the total contract price so divided as to facilitate payments to subcontractors. Upon approval, this breakdown of the contract price, unless later found to be in error, shall be used as a basis for all applications for payment.

Unless otherwise provided in the Special Conditions or the Contract Agreement, the Contractor may make application for partial payment once each calendar month based on an approved estimate of work completed. The application shall be submitted through and certified by the Architect. The Owner will make partial payments to the Contractor as soon as practicable after receipt of the certified application for payment.

An application for partial payment may include the Contractor's cost of materials not yet incorporated in the work but delivered and suitably stored on the site.

In making partial payments there shall be retained not more than five (5) percent of the estimated amount of work done and the value of materials stored on the site, and after 50 percent completion has been accomplished, no further retainage will be withheld. The retainage above set out shall be held until final completion and acceptance of all work covered by the contract.

If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (41 U.S.C. 15), a release may also be required of the assignee at the option of the Contracting Officer or USPFO of the State. The retainment on partial payments of Federal funds shall be determined by the USPFO of the State in conformance with the Defense Acquisition Regulations (DAR).

The Contractor, immediately after being notified by the Contracting Officer that all other requirements of the Contract have been completed, shall give notice of said completion by an advertisement for a period of four (4) successive weeks in some newspaper of general circulation published within the county where the work was performed. Proof of publication of said notice in duplicate shall be furnished by the Contractor to the Architect by affidavit of the publisher and a printed copy of the notice published in duplicate. If no newspaper is published in the county where the work was done, the notice may be given by posting at the Court House for thirty (30) days and proof of same made by the Probate Judge or Sheriff and the Contractor. Final payment shall be due as noted by the Contracting Officer's verification of the Final Application for Payment.

#### 29. VERIFICATION, CERTIFICATION, AND APPROVALS FOR PAYMENT:

When the Contractor has made application for payment as above, the Contracting Officer shall, not later than the date when each payment falls due, verify the application for Payment to the Contractor for such amount as he decides to be properly due, or state in writing to the Contractor his reasons for withholding verification in whole or in part, and place the application in line for payment.

No such verification nor payment made to the Contractor, nor partial or entire use or occupancy of the work by the Owner, shall be an acceptance of any work or materials not in accordance with the Contract.

All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of material and work upon which payments have been made or the restoration of any damaged work or as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract.

#### 30. PAYMENTS WITHHELD:

The Owner may withhold payment of the whole or any part of a verified or approved Application for Payment to such an extent as may be necessary to protect himself from loss on account of any of the following causes discovered subsequent to its verification or approvals:

- A. Defective work.
- B. Evidence indicating probable filing of claims by other parties against the Contractor.
- C. Failure of the Contractor to promptly make payments to subcontractors, or for materials, labor, equipment and supplies.
  - D. Damage to another contractor under a separate Contract with the Owner.

When the above grounds are removed, applications for payments will then be verified and/or approved for amounts not previously verified and approved because of them.

#### 31. CONTRACTOR AND SUBCONTRACTORS INSURANCE:

The Contractor shall not commence work under the Contract until he has obtained all insurance required thereunder from an insurance company authorized to do business in Alabama, and shall have filed the certificate of insurance showing type of coverage and correlation between the insurance furnished and that required or the certified copy of the insurance policy with the Contracting Officer through the Architect; nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance has been so obtained and filed. Each insurance policy shall contain a clause that it shall not be cancelled by the insurance company without thirty (30) days' written notice to the Owner of intention to cancel. The amounts of such insurance shall not be less than the following:

A.	Workmen's Compensation and Employer's Liability:	\$ Statutory
B.	Public Liability, BodilyInjury and Property Damage:	
	Injury or death of one person: Injury or death to more than one	\$ 50,000
	person in a single occurrence:	\$200,000
	Property Damage:	\$ 50,000
C.	Automobile and Truck Liability, Bodily Injury and Property Damage:	
	Injury or death to one person: Injury or death to more than one	\$ 50,000
	person in a single occurrence:	\$200,000
	Property Damage:	\$ 50,000
D.	Indemnity:	SEE BELOW

The Contractor shall assume all liability for and shall indemnify and save harmless, the State, Owners, Architect, and employees of the Armory Commission, from all damages and liability for injury to any person or persons, and injury to or destruction of property, including the loss of use thereof, by reason of an accident or occurrence arising from operations under the Contract, whether such operations be by himself or by a Subcontractor or by any one directly or indirectly employed by either of them, occurring on or about the premises, or the ways and means immediately adjacent, during the term of the contract, or any extension thereof, and shall also assume the liability for injury and/or damages to adjacent or neighboring property by reason of work done under the Contract.

The Contractor shall take out and maintain during the life of the Contract, insurance covering his liability under the above save harmless provision, and shall show evidence of coverage on the certificate of coverage previously noted.

The obligations of the Contractor under this paragraph 31-D shall not extend to the liability of the Architect, his agents or employees arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

## 32. OWNER'S FIRE INSURANCE (NOT USED)

# 33. FIRE INSURANCE, EXTENDED COVERAGE, VANDALISM AND MALICIOUS MISCHIEF:

Unless otherwise provided in the Modified General or Special Conditions, the Contractor shall, at his own expense, insure the Work included in the Contract against loss or damage by fire and against loss or damage covered by the standard extended coverage endorsement, with an insurance company or companies qualified to do business in Alabama and acceptable to the Owner, the amount of insurance at all times to be at least equal to the amount paid on account of work or materials incorporated in the Work and plus the value of work or materials furnished or delivered but not yet paid for by the Owner. The policies shall be in the names

of the Owners and the Contractor and "all Subcontractors" as their interests appear, and certificates of the insurance company as to the amount and type of coverage, terms of policies, etc., shall be delivered to the Contracting Officer through the Architect before partial payments are made.

When changes in scope of the work by written Change Order or Change Orders/Supplemental Agreements aggregate an amount equal to 15% of the total contract, including the Change Orders/Supplemental Agreements, the insurance coverage included under this heading shall be increased accordingly. Proof of coverage shall be established by endorsement to the original policy or by reissue of the original policy to include the added coverage, or in accordance with any other acceptable policy of the insuring company for increasing the coverage.

# 34. CONTRACT BONDS:

In order to insure the faithful performance of each and every condition, stipulation, and requirement of the Contract, and to indemnify and save harmless the Owner from any and all damages, either directly or indirectly (arising out of any failure to perform same), the successful Bidder to whom the Contract is awarded shall, within ten (10) days from the date of the award, unless otherwise stipulated in the Modified General Conditions, furnish at his own expense and file with the Owner an acceptable Surety Bond in an amount equal to one hundred (100) percent of the contract bid price of the Contract as awarded. Said Bond shall be made on the approved bond form, shall be furnished by a reputable surety company authorized to do business in the State of Alabama, shall be countersigned by an authorized agent resident in the State who is qualified for the execution of such instruments, and shall have attached thereto power of attorney of the signing official. In case of default on the part of the Contractor, all expenses incident to ascertaining and collecting losses suffered by the Owner under the Bond, including architectural, engineering, administrative, and legal services, shall lie against the Contract Bond for Performance of the Work.

In addition thereto, the successful Bidder to whom the Contract is awarded shall, within ten (10) days, unless otherwise stipulated in the General Conditions, furnish at his expense and file with the Owner an acceptable surety bond for Payment of Labor, materials, equipment and supplies, payable to the Owner in an amount equal to fifty (50) percent of the Contract Price, with the obligation that the Contractor shall promptly make payment to all persons furnishing him or them with labor, materials, or supplies for, or in the prosecution of the Work, including the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in suits on said bond. The date of neither bond shall be earlier than the date of the Contract Agreement.

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the State, or if any such surety shall fail to furnish reports as to his financial condition from time to time as requested by the State, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the State or of persons supplying labor or materials in the prosecution of the work contemplated by the contract.

Bonds shall remain in force during the entire guarantee period stipulated in the Contract.

# 35. DAMAGES:

Should either party of the Contract suffer damages because of any wrongful act or neglect of the other party or of anyone employed by him, claim shall be made in writing to the other party within a reasonable time of the first observance of such damage, and not later than the date of the Application for Final Payment, except as expressly stipulated otherwise in the case of faulty work or materials.

## 36. LIENS:

The Owner may request a complete release of all liens and if this is done, neither the Final Payment nor any part of the retained percentage shall become due until the Contractor shall deliver to the Owner a complete release of all liens arising out of the Contract, and, an affidavit that so far as he has knowledge or information the releases include all the labor and material for which a lien could be filed; but the Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

#### 37. ASSIGNMENT:

The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due or to become due to him hereunder without the previous written consent of the Owner.

#### 38. MUTUAL RESPONSIBILITY OF CONTRACTORS:

If the Contractor or any of his Subcontractors cause any loss or damage to any separate contractor with a prior, concurrent, or subsequent contract on the Work or on the site, or any undue delay to such separate contractor on the Work or on the site, and if such contractor makes claim against the Owner, on account of any loss so sustained, the Owner shall notify the Contractor who shall indemnify and save harmless the Owner against any expenses arising therefrom.

# 39. SEPARATE CONTRACTS:

The Owner may award other contracts for additional new construction, buildings or equipment, or for reconstruction, alteration, equipment, and improvement of existing buildings on the site, and the Contractor shall fully cooperate in the storage of materials and the detailed execution of work, coordinate and integrate his operations with such other contractors, and carefully fit his own work to that provided under other contracts, as he may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor.

The Contractor, including his Subcontractors, shall keep himself informed of the progress and the detailed work of other contractors and shall notify the Contracting Officer immediately of lack of progress or defective workmanship on the part of other contractors, where such delay or such defective workmanship will interfere with his own operations of the work.

#### 40. SUBCONTRACTS:

Concurrent with the execution of the Contract by the Contractor he shall submit in writing in five (5) counterparts to the Architect for approval by the Architect and the Contracting Officer the names of the Subcontractors proposed for the work. Subcontractors that have been so approved may not be changed thereafter except at the request of or with the approval of the Contracting Officer.

The Contractor shall not employ any subcontractor to whom the Owner or Contracting Officer may have any objection, but he will not be required to employ any subcontractor against whom he himself has a reasonable objection.

The Contractor shall be as fully responsible to the Owner for the acts and omissions of Subcontractors, and of persons employed by them, as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner.

# 41. RELATIONS OF CONTRACTOR AND SUBCONTRACTORS:

The Contractor shall cause appropriate provisions to be inserted in all Subcontracts relative to the Work, to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the work of Subcontractors, and to give the Contractor the same power as regards terminating any provisions of the Contract Documents.

The Articles, Divisions, Sections, or Paragraphs of the Specifications are not intended to control the Contractor in dividing the work among Subcontractors or to limit the work performed by any trade.

The Contractor shall be responsible for the coordination of Subcontractors, of the trades, and material men engaged upon his work.

The Contractor shall, without additional expense to the Owner, utilize the services of specialty subcontractors on those parts of the work which are specified to be performed by specialty subcontractors.

The Contracting Officer or the Architect will not undertake to settle any differences between the Contractor and his Subcontractors or between Subcontractors.

#### 42. ARCHITECT'S STATUS:

The Architect named in the Contract Documents, who prepared and furnished the Working Drawings and the Specifications contained therein, will prepare details and explanatory drawings, and provide instructions during the progress of the work for transmittal by the Contracting Officer or Architect as above set forth under paragraph 3, ADDITIONAL DETAIL DRAWINGS AND INSTRUCTIONS. He will make his check of manufacturers' data and shop drawings submitted by the Contractor for the Work as above set forth under 5, SHOP DRAWINGS.

The Architect will endeavor to require the Contractor to strictly adhere to the plans and specifications, to guard the Owner against defects and deficiencies in the work of Contractors, and shall promptly notify the Contracting Officer in writing of any significant departure in the quality of materials or workmanship from the requirements of the plans and specifications, but he does not guarantee the performance of the contracts.

The Architect shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, unless spelled out in the Contract Documents, and he shall not be liable for results of the Contractor's failure to carry out the work in accordance with the Contract Documents.

The Architect shall have authority to require the Contractor to stop the Work whenever in his opinion it may be necessary for the proper performance of the Contract. The Architect shall not be liable to the Owner for the consequences of any decision made by him in good faith either to exercise or not to exercise his authority to stop the Work.

The Architect shall not be responsible for the acts or omissions of the Contractor, or any Subcontractors, or any of the Contractor's or Subcontractor's agents or employees, or any other persons performing any of the Work.

#### 43. ARCHITECT'S DECISIONS:

The Architect's decisions in matters relating to the artistic effect of his work shall be final, if within the other terms of the Contract.

# 44. CONTRACTING OFFICER'S DECISIONS:

Except as hereinafter provided, any claim or question concerning the interpretation or meaning of the Contract Documents, or concerning a breach of the Contract, shall be submitted to the Contracting Officer and his decision shall be final, binding, and conclusive on the parties to the Contract. He shall have executive authority to enforce and make effective such decisions and orders as the Contractor fails to carry out promptly.

#### 45. CASH ALLOWANCES:

No cash allowances shall be included in the Contract Price, unless specifically set forth under SPECIAL CONDITIONS or MODIFICATIONS of the GENERAL CONDITIONS. When so included, the Contractor shall include in the Contract Price all allowances named therein and shall cause the work so covered to be done by such subcontractors, material, and/or equipment men, and for such sums as the Contracting Officer approves, and the Contract Price shall be adjusted in conformance therewith. The Contract Price shall include all the Contractor's expense, overhead, and profit, and no allowance, other than that included in the Contract Price, will be paid by the Owner.

#### 46. USE OF PREMISES; SANITARY PROVISIONS:

The Contractor shall take every precaution against injuries to persons or damages to property.

The Contractor shall comply with local and State regulations governing the operation of premises which are occupied and shall perform the Contract in such a manner as not to interrupt or interfere with the operation of any other facility.

The Contractor shall store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of his work or the work of any other contractors.

Unless otherwise provided, temporary storage sheds, shops, and office facilities may be erected on the premises with the approval of the Architect or the Contracting Officer. Such temporary buildings and/or utilities shall remain the property of the Contractor and be removed at his expense upon completion of the Work, unless the Owner authorized their abandonment without removal.

Necessary crossings of curbings, sidewalks, roadways, or parkways shall be protected against damage, and any damage shall be repaired by or at the expense of the Contractor.

The Contractor shall not place upon the Work or any part thereof loads inconsistent with the safety of that portion of the Work.

No Contractor shall perform any work necessary to be performed after regular working hours or on Sundays or legal holidays without extra compensation.

The Contractor shall provide and maintain such sanitary accommodations for the use of his employees and those of his subcontractors as may be necessary to comply with the requirements and regulations of the local and State Department of Health and as directed.

#### 47. CUTTING AND PATCHING:

The Contractor shall do all necessary cutting, fitting, and patching of the Work that maybe required to properly receive the Work to make its several parts join together properly, receive and provide for the work of various trades, and be received by the work of other contractors, or as required by Drawings and Specifications to complete the Work. After such cutting, he shall replace or restore or repair and make good all defective or patched work as required by the Architect. He shall not cut, excavate, or otherwise alter any work in a manner or by a method or methods that will endanger the Work, adjacent property, workmen, the public, or the work of any other contractor.

The Contractor shall have his Subcontractor check the location of all sleeves, openings, slots, etc., for the piping, ducts, breeching, conduits, louvers, grilles, fans, etc., as they are laid out on the job.

Provision for openings, holes, and clearances through walls, beams, floors, ceilings, and partitions shall be made and checked by the Contractor and/or his Subcontractor in advance of constructing such parts of the Work, and unnecessary, superfluous or dangerous cutting avoided.

Pipes passing through concrete or masonry walls shall be protected by pipe sleeves two sizes larger than the pipe, plus its insulation, to provide free movement.

Under no condition shall structural, framing, or other parts or members subjected to computed stress be cut or disturbed without the approval of the Architect. Any plates, studs, or joists, and/or rafters that are approved to be cut to execute necessary work shall be securely strapped and braced to restore their original strength by an approved method.

The Architect's approval shall be obtained before cutting or drilling holes in concrete or masonry that tend to damage or weaken the load capacity.

#### 48. PERIODIC AND FINAL CLEANUP:

The Contractor shall periodically, or as directed during the progress of the Work, clean up and remove from the premises all refuse, rubbish, scrap materials and debris caused by his employees, his Subcontractors, or resulting from his work, to the end that at all times the premises are sanitary, safe, reasonably clean, orderly, and workmanlike. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings.

Before final completion and final acceptance the Contractor shall remove from the Owner's property, and from all public and private property, all tools, scaffolding, false work, temporary structures, and/or utilities

including the foundations thereof (except such as the Owner permits in writing to remain); rubbish and waste materials resulting from his operations or caused by his employees; and shall remove all surplus materials, leaving the site clean and true to line and grade, and the Work in a safe and clean condition, ready for use and operation.

In addition to the above, the Contractor shall be responsible for the following special cleaning for all trades as the work shall have been completed:

- A. Cleaning of all painted, enameled, stained, or baked enamel work: Removal of all marks, stains, finger prints and splatters from such surfaces.
- B. Cleaning of all glass: Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.
  - C. Cleaning and polishing of all hardware.
- D. Cleaning all tile, floor finish of all kinds: Removal of all splatter, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.
- E. Cleaning of all manufactured articles, materials, fixtures, appliances, and equipment: Removal of all stickers, rust stains, labels, and temporary covers, and cleaning and conditioning of all manufactured articles, material, fixtures, appliances, and electrical, heating, and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Architect; blowing out or flushing out of all foreign matter from all dust pockets, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, similar features; and freeing identification plates on all equipment of excess paint and the polishing thereof.

In case of failure to comply with the above requirements for any part of the work within the time specified by the Architect, he may cause the Work to be done and deduct the cost thereof from the Contract Price on the next or succeeding Application for Payment.

#### 49. GUARANTEE OF THE WORK:

Except as otherwise specified in the General Conditions or the Special Conditions, all work shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment, or workmanship for one year from the date of final completion of the Contract, or from full occupancy of the building by the Owner, whichever is earlier.

If, within any guarantee period, repairs or changes are required in connection with guaranteed work, which, in the opinion of the Contracting Officer or Architect are required as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract requirements, the Contractor, shall, promptly upon receipt of notice from the Owner, and without expense to the Owner:

- A. Place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein; and
- B. Make good all damage to the building or site, or equipment or contents thereof, which, in the opinion of the Contracting Officer or Architect, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract; and
- C. Make good any work or material, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

In any case where in fulfilling the requirements of the Contract or of any guarantee, embraced in or required thereby, the Contractor disturbs any work guaranteed under another contract, he shall restore such disturbed work to a condition satisfactory to the Contracting Officer and guarantee such restored work to the same extent as it was guaranteed under such other contract.

If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his Surety shall be liable for all expense incurred.

All special guarantees applicable to definite parts of the work that may be stipulated in the Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee.

#### 50. POSSESSION PRIOR TO COMPLETION:

The Owner shall have the right to use any completed or partially completed part of the Work. Such use shall not be deemed an acceptance of any work not completed in accordance with the contract requirements. If, however, such prior use by the Owner delays the progress of the Work or causes additional expenses to the Contractor, an equitable adjustment in the Contract Price and/or time of completion will be made and the Contract will be modified in writing accordingly.

#### 51. LIQUIDATED DAMAGES:

Time is the essence of the Contract. Any delay in the completion of the Work as provided for in the Contract Documents will cause inconvenience to the public and loss and damage to the Owner in interest, and in additional administrative, architectural, inspection and supervision charges.

Therefore, a time charge equal to six per cent interest per annum on the total Contract Price will be made against the Contractor for the entire period that any part of the Work remains uncompleted after the time specified for the completion of the Work as provided in the Contract Documents, the amount of which shall be deducted by the Contracting Officer from the Final Estimate, and shall be retained by the Contracting Officer out of moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, it being mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

#### 52. USE OF FOREIGN MATERIALS:

In accordance with ACT 876 of the 1961 Regular Session of the Alabama legislature the Contractor shall use only materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at reasonable prices.

Breaching of this agreement shall render the Contractor liable for payment of liquidated damages in the amount of not less than \$500.00 nor more than 20% of the gross amount of the contract.

This requirement applies to all contracts for public works financed entirely with State of Alabama funds.

# 53. WITHHOLDING OF FUNDS (1977 DEC)

- A. The Contracting Officer may withhold or cause to be withheld from the prime contractor so much of the accrued payments or advances as maybe considered necessary (1) to pay laborers and mechanics, including apprentices, trainees, watchmen and guards, employed by the Contractor or any subcontractor on the work the full amount of wages required by the contract, and (2) to satisfy any liability of the Contractor and any subcontractor for liquidated damages under paragraph (B) of the clause entitled "Contract Work Hours and Safety Standards Act Overtime Compensation."
- B. If the Contractor or any subcontractor fails to pay any laborer, mechanic, apprentice, trainee, watchman, or guard employed or working on the site of the work all or part of the wages required by the contract, the Contracting Officer may, after written notice to the prime contractor, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased.

#### 54. DISPUTES CONCERNING LABOR STANDARDS (ASPR 7-602.23)(77 DEC)

Disputes arising out of the labor standards provisions of this contract shall be subject to the DISPUTES clause except to the extent such disputes involve the meaning of classifications or wage rates contained in the wage determination decision of the Secretary of Labor or the applicability of the labor provisions of this

contract which questions shall be referred to the Secretary of Labor in accordance with the procedures of the Department of Labor.

#### 55. DISPUTES

Except as otherwise specifically provided in this contract, and except as otherwise specifically provided by the State procedure for arbitration or other State procedure established by State law, any dispute concerning a question of fact arising under this contract which is not disposed of by mutual agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and send by registered mail, return receipt requested, a copy thereof to the Contractor at his address shown herein. Within thirty (30) days after the date of receipt of such copy, the Contractor may appeal in writing to the Governor of this State, whose written decision therein, or that of his designated representative or representatives, shall, unless determined by a court of competent jurisdiction to have been fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence, be final and conclusive: Provided, that if no such appeal is taken, the decision of the Contracting Officer shall be final and conclusive. The Governor of this State may designate an individual or individuals other than the Contracting Officer, or a board, as his authorized representative to determine appeals under this Article. In connection with any appeal proceeding under this Clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision. Any sum or sums allowed to the Contractor under the provisions of this Article or under the State Arbitration proceedings or under other State procedure shall be paid subject to approval of the Chief, National Guard Bureau, for the Government's share of the cost of the Articles or work herein disputed as deemed to be within the contemplation of this contract.

# 56. EQUAL OPPORTUNITY (FEDERALLY ASSISTED CONSTRUCTION) (ASPR 7-103.18)(1978 SEP)

If, during any twelve (12) month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded Federal contracts and/or subcontracts which have an aggregate value in excess of \$10,000, the Contractor shall comply with (A) through (G) below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.)

The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the Regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following Equal Opportunity clause:

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

- A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
- C. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

- D. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and of the rules, regulations and relevant orders of the Secretary of Labor.
- E. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- F. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations or orders, this contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or Federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.
- The Contractor will include the portion of the sentence immediately preceding paragraph (A) and the provisions of paragraphs (A) through (G) in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States. The applicant further agrees that it will be bound by the above Equal Opportunity Clause with respect to its own employment practices when it participates in Federally assisted construction work: Provided, that if the applicant so participating is a State or local government, the above Equal Opportunity Clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of Contractors and subcontractors with the Equal Opportunity Clause and the rules, regulations and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and Federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the Equal Opportunity Clause as may be imposed upon Contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: cancel, terminate or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

# 57. CERTIFICATION OF NONSEGREGATED FACILITIES (1970 AUG) (ASPR 7-2003.14)

(Applicable to contracts, subcontracts, and to agreements with applicants who are themselves performing Federally assisted construction contracts, exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause). By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are

maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion or national origin, because of habit, local custom or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of Equal Opportunity Clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods).

# NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES:

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

# 58. EXEMPTIONS TO EQUAL OPPORTUNITY CLAUSES (ASPR 12-805) (JUL 76)

- A. Transactions of \$10,000 or Under. Contracts and subcontracts not exceeding \$10,000, other than Government bills of lading, are exempt from the requirements of the Equal Opportunity Clause. In determining the applicability of this exemption to any Federally assisted construction contract, or subcontract thereunder, the amount thereof rather than the amount of the Federal financial assistance shall govern. Indefinite delivery type contracts and subcontracts thereunder, basic agreements and basic ordering agreements shall include the Equal Opportunity Clause, except when the Contracting Officer (in the case of subcontractors, the prime contractor or subcontractors issuing the subcontract) determines that the amount to be ordered is not expected to extend \$10,000 in any single year. The applicability of the Equal Opportunity Clause shall be determined by the Contracting Officer at the time of award for the first year, and annually thereafter for succeeding years if any. Notwithstanding the above, the Equal Opportunity Clause shall be incorporated into such contract, subcontract, basic agreement or basic ordering agreement whenever the amount of a single order or procurement action exceeds \$10,000. Once the clause is incorporated, the contract, subcontract, basic agreement, or basic ordering agreement shall continue to be subject to such clause for its duration, regardless of the amounts ordered, or reasonably expected to be ordered, in any year. No Contracting Officer, Contractor, or Subcontractor, shall procure supplies or services in less than usual quantities to avoid applicability of the Equal Opportunity Clause.
- B. Work Outside the United States. Contracts and subcontracts are exempt from the requirement of the Equal Opportunity Clause with regard to work performed outside the United States by employees who were not recruited within the United States.
- C. Contracts with State or Local Governments. The requirements of the clause in any contract or subcontract with a State or local government (or any agency, instrumentality or subdivision thereof) shall not be applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract or subcontract. In addition, State and local governments are exempt from the requirements of filing the annual compliance report provided for by 12-812(a) and maintaining a written affirmative action program prescribed by 12-807.1.
  - D. Contracts Exempted by the Secretary of Defense in the Interest of National Security.
- (1) Any requirement set forth in this Part shall not apply to any contract or subcontract whenever the Secretary of Defense determines that such contract or subcontract is essential to the national security and that its award without complying with such requirement is necessary to the national security.
- (2) Requests for Exemption: The Contracting Officer shall prepare a detailed justification for such determination which shall be submitted to the ASD(M&RA) in accordance with Departmental procedures.

The ASD(M&RA) shall submit the request for exemption to the Secretary of Defense for approval, and shall notify the Director, OFCC, within 30 days of such a determination.

#### E. Specific Contracts and Facilities Exempted by the Director, OFCC.

- (1) Specific Contracts. The Director, OFCC, may exempt an agency or person from requiring the inclusion of any or all of the Equal Opportunity Clause in any specific contract or subcontract when he deems that special circumstances in the national interest so require. He may also exempt groups or categories of contracts or subcontracts of the same type where he finds it impracticable to act upon each request individually or where group exemptions will contribute to convenience in the administration of the Order.
- (2) Facilities Not Connected with Contracts. The Director, OFCC, may exempt from the requirements of the clause any of a prime contractor's or a subcontractor's facilities which he finds to be in all respects separate and distinct from activities of the prime contractor or subcontractor related to the performance of the contract or subcontract, provided that he also finds that such an exemption will not interfere with or impede the effectuation of the Order.
- (3) Special Circumstances. The Director, OFCC, may exempt a contract or subcontract when he finds that special circumstances indicate that use of either of the clauses in 7-103.18 in the contract or subcontract would not be in the national interest.
- (4) Request for Exemptions. The Contracting Officer shall submit a detailed justification for omitting or modifying the clause under (1), (2) or (3) above to the ASD (M&RA) in accordance with Departmental procedures.
- (5) Withdrawal of Exemption by the Director, OFCC. When any contract or subcontract is of a class exempted under this paragraph 12-805, the Director, OFCC, may withdraw the exemption for a specific contract or subcontract or group of contracts or subcontracts when in his judgement such action is necessary or appropriate to achieve the purposes of the Order. Such withdrawal shall not apply to contracts or subcontracts awarded prior to the withdrawal. In procurements entered into by formal advertising or the various forms of restricted formal advertising, such withdrawal shall not apply unless the withdrawal is made more than 10 calendar days before the date set for the opening of the bids.

# 59. CLEAN AIR AND WATER (1975 OCT)(ASPR 7-103.29)

(Applicable only if the contract exceeds \$100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any one year will exceed \$100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c) and is listed by EPA, or the contract is not otherwise exempt.)

#### A. The Contractor agrees as follows:

- (1) To comply with all the requirements of Section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Public Law 91-604) and Section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, as amended by Public Law 92-500), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in Section 114 and Section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.
- (2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.
- (3) To use his best efforts to comply with clean air standards and clean water standards at the facilities in which the contract is being performed; and
- (4) To insert the substance of the provisions of this clause in any nonexempt subcontract, including this paragraph (4).

- B. The terms used in this clause have the following meanings:
- (1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Public Law 91-604).
- (2) The term "Air Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Public Law 92-500).
- (3) The term "Clean Air Standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in Section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d), an approved implementation procedure or plan under Section 111(c) or Section 111(d), respectively of the Air Act (42 U.S.C. 1857c-6(c) or (d), or an approved implementation procedure under Section 112(d) of the Air Act (42 U.S.C. 1857c-7(d).
- (4) The term "Clean Water Standards" means any enforceable limitation, control, condition, prohibition, standard or other requirement which is promulgated pursuant to the Water Act or obtained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by Section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by Section 307 of the Water Act (33 U.S.C. 1317).
- (5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirement of the Air Act or Water Act and regulations issued pursuant thereto.
- (6) The term "facility" means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor, subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except there the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.
- (7) The term "nonexempt contract or subcontract" means a contract or subcontract of more than \$100,000 which is not otherwise exempted pursuant to the EPA regulations implementing the Air Act and Water Act (40 CFR 15.5), as further implemented in ASPR 1-2302.4 or in FPR 1-1.2302-4 whichever is applicable) and the procedures of the Department awarding the contract.

# 60. CLEAN AIR AND WATER CERTIFICATION (77 JUN) (DAR 7-2003.71)

Applicable if the bid or offer exceeds \$100,000, or the Contracting Officer has determined that orders under an indefinite quantity contract in any year will exceed \$100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or is not otherwise exempt.

The Bidder or offeror certifies as follows:

- (1) Any facility to be utilized in the performance of this proposed contract <u>is</u> (\_) or <u>is not</u> (\_), listed on the Environmental Protection Agency List of Violating Facilities;
- (2) He will promptly notify the Contracting Officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, U. S. Environmental Protection Agency, indicating that any facility which he proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and
- (3) He will include substantially this solicitation certification, including this paragraph (3), in every nonexempt subcontract.

# 61. EXEMPTIONS TO ENVIRONMENTAL PROTECTION CLAUSE (ASPR 1-2302.4) (JUL 76)

Except as provided in (c) below, contracts and subcontracts are exempt from the requirements of this Part and 40 CFR Part 15, as follows:

- A. Contracts and subcontracts not exceeding \$100,000 are exempt.
- B. Contracts and subcontracts for indefinite quantities are exempt if the Contracting Officer determines that the amount to be ordered in any year under such contract will not exceed \$100,000.
- C. Except for small purchases, the foregoing exemptions shall not apply to a proposed contract under which the facility to be used is listed on the EPA List of Violating Facilities on the basis of a conviction either under the Air Act (40 U.S.C. 1857-8(c)(1) or the Water Act (33 U.S.C. 1319(c)).
- D. This part and 40 CFR Part 15 do not apply to the use of facilities located outside the United States. The term "United States," as used herein, includes the States, District of Columbia, Commonwealth of Puerto Rico, Virgin Islands, Guam and American Samoa, and Trust Territories of the Pacific Islands.
- E. Upon a determination that the paramount interest of the United States so requires, the Secretary concerned may except from the provisions of this Part any individual or class of contracts or subcontracts, for a period of one year. Prior to granting a class exemption, the Secretary shall consult with the Director, Office of Federal Activities, United States Environmental Protection Agency. The Secretary granting either an individual contract or class exemption shall notify the Director of such exemption as soon after granting the exemption as practicable. Such notification shall describe the purpose of the contract, and indicate the manner in which the paramount interest of the United States required that the exemption be made.

# 62. AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (ASPR 7-103.28) (76 MAY)

- A. The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon either physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
- B. The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
- C. In the event of the Contractor's noncompliance with the requirements of this clause, action for noncompliance may be taken in accordance with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
- D. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the Contracting Officer. Such notices shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.
- E. The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.
- F. The Contractor will include the provisions of this clause in every subcontract or purchase order of \$2500 or more unless exempt by rules, regulations, or orders of the Secretary issued pursuant to Section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance.

#### 63. COVENANT AGAINST CONTINGENT FEES

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the Owner shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

#### 64. OFFICIALS NOT TO BENEFIT

No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

#### 65. CONVICT LABOR

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment, as provided by Public Law 89-176, September 10, 1965 (18 U.S.C. 4082(c)(2)) and Executive Order 11755, December 29, 1973.

#### 66. NONDISCRIMINATION IN EMPLOYMENT

In connection with the performance of work under this contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of sex, race, creed, color, or national origin; and further agrees to insert the foregoing provision in all subcontracts hereunder except subcontracts for standard commercial supplies or for raw materials.

#### 67. GRATUITIES

- A. The State may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found, after notice and hearing, by the Contracting Officer or Governor or the duly authorized representative of either, that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the State with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performance of such contract: Provided, that the existence of the facts upon which the Contracting Officer or Governor or the duly authorized representative of either makes such findings shall be in issue and may be reviewed in any competent court.
- B. In the event this contract is terminated as provided in paragraph (a) hereof, the State shall be entitled (1) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor, and (2) as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Contracting Officer or Governor or the duly authorized representative of either) which shall not be less than 3 nor more than 10 times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.
- C. The rights and remedies of the State provided in this Clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

#### 68. COPELAND ("ANTI-KICKBACK") ACT - NONREBATE OF WAGES

The regulations of the Secretary of Labor applicable to contractors and subcontractors (29 CFR, Part 3), made pursuant to the Copeland Act, as amended (40 U.S.C. 276c) and to aide in the enforcement of the Anti-Kickback Act (18 U.S.C. 874) are made a part of this contract by reference. The Contractor will comply with these regulations and any amendments or modifications thereof and the prime contractor will be responsible for the submission of affidavits required of subcontractors thereunder. The foregoing shall apply except as the Secretary of Labor may specifically provide for reasonable limitations, variations, tolerances and exemptions.

#### 69. SUBCONTRACTS - TERMINATION

The Contractor agrees to insert the clauses hereof entitled <u>COPELAND ("ANTI-KICKBACK") ACT-NONREBATE OF WAGES</u>, <u>WITHHOLDING OF FUNDS</u>, and <u>SUBCONTRACTS - TERMINATION</u> physically in all subcontracts and the Contractor further agrees that a breach of any of the requirements of these clauses may be grounds for termination of this contract. The term "contractor" as used in such clauses in any subcontract shall be deemed to refer to the subcontractor except in the phrase "prime contractor."

## 70. AUDIT BY DEPARTMENT OF DEFENSE (1978 AUG)

- A. <u>General</u>. The Contracting Officer or his representatives shall have the audit and inspection rights described in the applicable paragraphs (B), (C) and (D) below.
- B. <u>Examination of Costs.</u> If this is a cost reimbursement type, incentive, time and materials, labor hour, or price redeterminable contract, or any combination thereof, the Contractor shall maintain, and the Contracting Officer or his representatives shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this contract. Such right of examination shall include inspection at all reasonable times of the Contractor's plants, or such parts thereof, as may be engaged in the performance of this contract.
- C. <u>Cost or Pricing Data</u>. If the Contractor submitted cost or pricing data in connection with the pricing of this contract or any change or modification thereto, unless such pricing was based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or his representatives who are employees of the United States Government shall have the right to examine all books, records, documents and other data of the Contractor related to the negotiation, pricing or performance of such contract, change or modification, for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data submitted. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.
- D. <u>Reports</u>. If the Contractor is required to furnish Contractor Cost Data Reports (CCDR), Contract Fund Status Reports (CFSR), or Cost Performance Reports (CPR), the Contracting Officer or his representatives shall have the right to examine books, records, other documents, and other supporting materials, for the purpose of evaluating (i) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports, and (ii) the data reported.
- E. <u>Availability</u>. The materials described in (B), (C) and (D) above shall be made available at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction, until the expiration of three (3) years from the date of final payment under this contract or such lesser time specified in Appendix M of the Defense Acquisition Regulation and for such longer period, if any, as is required by applicable statute, or by other clauses of this contract, or by (1) and (2) below:
- (1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three (3) years from the date of any resulting final settlement.
- (2) Records which relate to appeals under the <u>DISPUTES</u> Clause of this contract, or litigation, or the settlement of claims arising out of the performance of this contract, shall be made available until such appeals, litigation, or claims have been disposed of.
- F. The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (F), in all subcontracts exceeding \$10,000 hereunder, except altered as necessary for proper identification of the contracting parties and the Contracting Officer under the State prime contract.

# 71. SUBCONTRACTOR COST OR PRICING DATA - PRICE ADJUSTMENTS (1970 JAN)

A. Paragraphs (B) and (C) of this Clause shall become operative with respect to any modification made pursuant to one or more provisions of this contract which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed \$100,000. The requirements of this Clause shall be limited to such modifications.

- B. The Contractor shall require subcontractors hereunder to submit cost or pricing data under the following circumstances:
- (1) prior to the award of any subcontract the amount of which is expected to exceed \$100,000 when entered into:
- (2) prior to the pricing of any subcontract modification which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed \$100,000; except where the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation.
- C. The Contractor shall insert the substance of this clause including this paragraph (C) in each subcontract which exceeds \$100.000.

# 72. BUY AMERICAN ACT (1966 OCT)

- A. <u>Agreement</u>. In accordance with the Buy American Act (41 U.S.C. l0a l0d), the Contractor agrees that only domestic construction material will be used (by the Contractor, subcontractors, materialmen, and suppliers) in the performance of this contract, except for non-domestic construction material listed in the "Nondomestic Construction Materials" clause, if any, of this contract.
- B. <u>Domestic construction material</u>. "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.
- C. <u>Domestic component</u>. A component shall be considered to have been mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.
- D. <u>Non-Domestic construction material</u>. The Contractor/Vendor agrees that it will not expend any funds appropriated by Congress without complying with The Buy American Act (41 U.S.C. 10). The Buy American Act gives preference to domestic end products and domestic construction material. In addition, the Memorandum of Understanding between the United States of America and the European Economic Community on Government Procurement, and the North American Free Trade Agreement (NAFTA), provide that EC and NAFTA end products and construction materials are exempted from application of the Buy American Act.

#### 73. APPROVAL

This contract and any subsequent terminations, modifications, or change orders (including those resulting from disputes and settlements of disputes) shall be subject to the written approval of the Chief, National Guard Bureau, or his duly authorized representative, and shall not be binding until so approved.

#### 74. SUBJECT TO FEDERAL-STATE AGREEMENT

This contract is subject to all terms and conditions of the Federal-State Agreement between the United States of America and the State of Alabama.

## 75. RELATIONSHIP OF THE FEDERAL GOVERNMENT

This contract is funded in part by the Federal Government. The Federal Government is not a party to this contract. As a condition to receiving and expending Federal funds, there are certain rights of Federal inspection, Federal approval of contract changes and modifications, and Federal approval of settlements or dispute actions that the Federal Government will exercise prior to authorization of Federal funds. Therefore, no inspection or acceptance, change, modification, settlement, dispute claim payment, or dispute action will be

considered binding until the required Federal approval is obtained. The Chief, National Guard Bureau, or his designated representative, is the approval authority. This paragraph does not abrogate any rights conferred on the Federal Government by law or other clause required due to the use of Federal funding.

# 76. SUSPENSION OF WORK (1968 FEB) (DAR 7-602.46)

- A. The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Owner.
- B. If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.
- C. No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in a amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract.

# 77. TERMINATION FOR CONVENIENCE OF THE OWNER - CONSTRUCTION (1974 APR) (DAR 7-602.29)

- A. The performance of work under this contract may be terminated by the Owner in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Owner. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.
- B. After receipt of a Notice of Termination, and except as otherwise directed by the Contracting Officer, the Contractor shall:
- (1) Stop work under the contract on the date and to the extent specified in the Notice of Termination;
- (2) Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the contract as is notterminated;
- (3) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;
- (4) Assign to the Owner, in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
- (5) Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this clause;
- (6) Transfer title and deliver to the Owner, in the manner, at the times, and to the extent, if any, directed by the Contracting Officer, (a) the fabricated or unfabricated parts, work in process, completed work, supplies, and other materials produced as a part of, or required in connection with the performance of, the work terminated by the Notice of Termination, and (b) the completed or partially completed plans,

drawings, information, and other property which, if the contract had been completed, would have been required to be furnished to the Owner;

- (7) Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in (6) above; provided, however, that the Contractor (a) shall not be required to extend credit to any purchaser, and (b) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Contracting Officer; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct;
- (8) Complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and
- (9) Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest.

At any time after expiration of the plant clearance period, as defined in Section VIII, Armed Services Procurement Regulation, as it may be amended from time to time, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Contracting Officer, and may request the Owner to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) days thereafter, the Owner will accept title to such items and remove them or enter into a storage agreement covering the same; provided, that the list submitted shall be subject to verification by the Contracting Officer upon removal of the items, or if the items are stored, within forty-five (45) days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

- C. After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer his termination claim, in the form and with certification prescribed by the Contracting Officer. Such claim shall be submitted promptly but in no event later than one year from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer, upon request of the Contractor made in writing within such one year period or authorized extension thereof. However, if the Contracting Officer determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such one year period or any extension thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.
- D. Subject to the provisions of paragraph C, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done; provided, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph E of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Contracting Officer to agree upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to this paragraph D.
- E. In the event of the failure of the Contractor and the Contracting Officer to agree, as provided in paragraph D, upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, the Contracting Officer shall pay to the Contractor the amounts determined by the Contracting Officer as follows, but without duplication of any amounts agreed upon in accordance with paragraph D:
- (1) With respect to all contract work performed prior to the effective date of the Notice of Termination, the total (without duplication of any items) of:

- (a) the cost of such work;
- (b) the cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in paragraph B(5) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the Notice of Termination of Work under this contract, which amounts shall be included in the cost on account of which payment is made under (A) above, and
- (c) a sum, as profit on "a" above, determined by the Contracting Officer pursuant to 8-303 of the Armed Services Procurement Regulation, in effect as of the date of execution of this contract, to be fair and reasonable; provided, however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed under this subdivision "c" and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and
- (2) The reasonable cost of the preservation and protection of property incurred pursuant to paragraph B(9); and any other reasonable cost incidental to termination of work under this contract, including expense incidental to the determination of the amount due to the Contractor as the result of the termination of work under this contract.

The total sum to be paid to the Contractor under (1) above shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor under (1) above, the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to paragraph B(7).

- F. Costs claimed, agreed to, or determined pursuant to C, D, E, and I hereof shall be in accordance with Section XV of the Armed Services Procurement Regulation as in effect on the date of this contract.
- G. The Contractor shall have the right of appeal, under the clause of this contract entitled "Disputes", from any determination made by the Contracting Officer under paragraph C, E, or I hereof, except that if the Contractor has failed to submit his claim within the time provided in paragraph C or I hereof, and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due under paragraph C, E, or I hereof the Owner shall pay to the Contractor the following: (1) if there is no right of appeal hereunder or if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (2) if an appeal has been taken, the amount finally determined on such appeal.
- H. In arriving at the amount due the Contractor under this clause there shall be deducted (1) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the terminated portion of this contract, (2) any claim which the Owner may have against the Contractor in connection with the contract, and (3) the agreed price for, or the proceeds of sale of any materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the Owner.
- I. If the termination hereunder be partial, the Contractor may file with the Contracting Officer a claim for an equitable adjustment of the price or prices specified in the contract relating to the continued portion of the contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any claim by the Contractor for an equitable adjustment under this clause must be asserted within ninety (90) days from the effective date of the termination notice, unless an extension is granted in writing by the Contracting Officer.
- J. The Owner may from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated portion of this contract whenever in the opinion of the Contracting Officer the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this clause, such excess shall be payable by the Contractor to the Owner upon demand, together with interest computed at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97 for the Renegotiation Board for the period from the date such excess payment is received by the Contractor to the date on which

such excess is repaid to the Owner; provided, however, that no interest shall be changed with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until ten days after the date of such retention or disposition, or such later date as determined by the Contracting Officer by reason of the circumstances.

K. Unless otherwise provided for in this contract, or by applicable statute, the Contractor shall--from the effective date of termination until the expiration of three years after final settlement under this contract-preserve and make available to the Owner at all reasonable times at the office of the Contractor but without direct charge to the Owner, all his books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this contract and relating to the work terminated hereunder, or, to the extent approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions thereof.

#### 78. USE OF UNITED STATES FLAG VESSELS

- A. To use privately-owned United States flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo lines, and tankers) of any equipment, materials, or commodities that are both (1) procured, contracted for, or otherwise obtained with funds made available by State under this contract, and (2) transported by ocean vessel, to the extent such vessels are available at fair and reasonable rates;
- B. To furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph A above to both State and to the Division of National Cargo, Office of Market Development, U.S. Maritime Administration, Washington, D.C. 20590; and,
- C. Subject to existing contracts, to insert the substance of the provisions of this section in all contracts issued pursuant to this contract, and to cause such provisions to be inserted in all subcontracts issued pursuant to this contract, where the contract or subcontract is for \$100,000 or more and where there is a possibility of ocean transportation of procured equipment or materials.

#### 79. DEBARMENT AND SUSPENSION

- A. Contractor/Vendor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension."
- B. The Final Rule, Government-Wide Debarment and Suspension (Nonprocurement), issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 25) to implement the provisions of Executive Order 12549, "Debarment and Suspension" is incorporated by reference and the Contractor/Vendor covenants and agrees to comply with all provisions thereof, including any amendments to the Final Rule that may hereafter be issued.

#### 80. NONDISCRIMINATION

- A. The Contractor/Vendor covenants and agrees that no person shall be denied benefits of, or otherwise be subjected to discrimination in connection with the Contractor/Vendor's performance under this MCA, on the ground of race, religion, color, national origin, sex or handicap. Accordingly and to the extent applicable, the Contractor/Vendor covenants and agrees to comply with the following:
- (1) Title VII of the Civil Rights Act of 1964 (42 U.S.C. 2000d <u>et seq.</u>), and DOD Regulations (32 CFR Part 300) issued thereunder;
- (2) Executive Order 11246 and Department of Labor Regulations issued thereunder (41 CFR Part 60);
- (3) Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) and DOD Regulations issued thereunder (32 CFR Part 56); and,
- (4) The Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.) and DOD Regulations issued thereunder (45 CFR Part 90).

#### 81. LOBBYING

- A. The Contractor/Vendor covenants and agrees that it will not expend any funds appropriated by Congress to pay any person for influencing or attempting to influence an officer or employee of any agency, or a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; and, the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- B. The Interim Final Rule, New Restrictions on Lobbying, issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 28) to implement the provisions of Section 319 of Public Law 101-121 (31 U.S.C. 1352) is incorporated by reference.

#### 82. DRUG-FREE WORK PLACE

- A. The Contractor/Vendor covenants and agrees that it will comply with the provisions of the Drug-Free Work Place Act of 1988 (Public Law 100-690, Title V, Subtitle D; 41 U.S.C. 701 et seq.) and maintain a drug-free workplace.
- B. The Final Rule, Government-Wide Requirements for Drug-Free Workplace (Grants), issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 28, Subpart f) to implement the provisions of the Drug-Free Work Place Act of 1988 is incorporated by reference and the Contractor/Vendor covenants and agrees to comply with all the provisions thereof, including any amendments to the Final Rule that may hereafter be issued.

#### 83. ENVIRONMENTAL STANDARDS

- A. The Contractor/Vendor agrees that its performance under this contract shall comply with: the requirements of Section 114 of the Clean Air Act (42 U.S.C. § 7414) and Section 308 of the Federal Water Pollution Control Act (33 U.S.C. § 1318), that relate generally to inspection, monitoring, entry reports, and information, and with all regulations and guidelines issued thereunder; the Resources Conservation and Recovery Act (RCRA); the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA); the National Environmental Policy Act (NEPA); and any applicable Federal, Contractor/Vendor or Local environmental regulation.
- B. The Contractor/Vendor shall insure that no facility used in its performance under this contract is listed on the Environmental Protection Agency (EPA) list of violating facilities pursuant to 40 CFR Part 15 without the concurrence of State. The Contractor/Vendor shall notify State of the receipt of any communication from EPA indicating that a facility to be or being used in its performance under this contract is under consideration for listing on the EPA list of violating facilities.
- C. For the purposes of this section, State agrees that the Contractor/Vendor's obligations in Paragraphs a. and b. of this section above shall not apply to any armory, base, training site, or other facility or portion thereof, the operation and maintenance of which is funded under this contract, that is currently listed as a violating facility, on the effective date of this contract, pursuant to 40 CFR Part 15; nor, shall such listing be the basis for State's termination for cause of this contract or for State's disallowance of any cost otherwise allowable under this contract. The Contractor/Vendor and State agree to cooperate to remediate, as expeditiously as possible, for any facility the operation and maintenance of which is within the scope of this contract, the condition giving rise to the listing of any such facility as a violating facility according to applicable statutes, regulations, or other agreements subject to the availability of funds.

#### 84. NATIONAL HISTORIC PRESERVATION

Any construction, acquisition, modernization, or other activity that may impact a historic property.

A. The Contractor/Vendor agree to identify to the awarding agency any property listed or eligible for listing on the National Register of Historic Places that will be affected by this award, and to provide any help the awarding agency may need, with respect to this award, to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.), as implemented by the Advisory Council on Historic Preservation regulations at 36 CFR Part 800 and Executive Order 11593 (3 CFR, 1971-1975 Comp., p. 559).

36 CFR Part 800 requires Grants Officers to get comments from the Advisory Council on Historic Preservation before proceeding with Federally assisted projects that may affect properties listed on or eligible for listing on the National Register of Historic Places.

#### 85. HATCH ACT

A. The Contractor/Vendor agrees to comply with the Hatch Act (5 U.S.C. 1501 - 1508 and 7324 - 7328), as implemented by the Office of Personnel Management at 5 CFR Part 151, which limits political activity of employees or officers of State or local governments whose employment is connected to an activity financed in whole or part with Federal funds.

# 86. CARGO PREFERENCE

Any agreement under which international air travel may be supported by U.S. Government funds.

A. Travel supported by U.S. Government funds under this agreement shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.

#### 87. RELOCATION AND REAL PROPERTY ACQUISITION

A. The Contractor/Vendor agrees that it will comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 et seq.) and regulations issued thereunder (49 CFR Part 24).

#### 88. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

A. The Contractor/Vendor agrees that it will comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards (40 U.S.C. 327-330) as supplemented by Department of Labor regulations (29 CFR Part 5). As applied to this agreement, the Contract Work Hours and Safety Standards Act specifies that no laborer or mechanic doing any part of the work contemplated by this agreement shall be required or permitted to work more than 40 hours in any workweek unless paid for all additional hours at not less than 1 1/2 times the basic rate of pay. This Act is applicable to any construction contract awarded in excess of \$2,000, and in excess of \$2,500 for other contracts which involve the employment of mechanics or laborers.

# 89. DAVIS-BACON ACT

When required by Federal assistance program legislation, such as the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, environmental remediation construction, the following provision applies.

A. The Contractor/Vendor agrees that it will comply with the Davis-Bacon Act (40 U.S.C. 276a to a-7) as supplemented by U.S. Department of Labor regulations (29 CFR Part 5). All rulings and interpretations of the Davis-Bacon Acts contained in 29 CFR Part 5 are incorporated by reference in this agreement. As applied to this agreement, the Davis-Bacon Act (40 U.S.C. 276a-276a-7) provides that contracts in excess of \$2,000 to which the Federal Government provides assistance funding for construction, alteration, or repair (including painting and decorating) of public buildings or public works within the United States, shall contain a provision that no laborer or mechanic employed directly upon the site of the work shall receive less than the prevailing wage rates as determined by the U.S. Secretary of Labor.

# 90. STATE ADDENDUM

A. "It is agreed that the terms and commitments contained herein shall not constitute a debt of The State of Alabama in violation of Article II, Section 213 of the Constitution of Alabama, 1901, as amended by Amendment 26. It is further agreed that if any provision of this contract shall contravene any statue, constitutional provision or amendment to the Constitution, now in effect or which may, during the course of this contract be enacted. Then that conflicting provision in the contract shall be deemed null and void."

- B. "The Contractor's sole remedy for settlement or any and all disputes arising under the Terms of this agreement shall be limited to filing a claim with The Board of Adjustment for the State of Alabama."
- C. "In event of proration of the fund from which payment under this contract is to be made; the contract will be subject to termination."
- D. "The Contractor acknowledges and understands this contract is not effective until it has received all requisite state government approvals and the Contractor shall not begin performance until notified to do so by State Property & Disbursing Office. The Contractor shall not be entitled to compensation for work performed prior to effective date of contract."

#### SECTION 00 73 00 - SPECIAL CONDITIONS OF THE CONTRACT

The following special conditions modify, change, delete, or add to the "General Conditions of the Contract", (June 2009) Section 00 72 00. Where any Article, Paragraph, or Clause of the General Conditions is modified or deleted by the Special Conditions, the unaltered provisions of that Article, Paragraph, or Clause remain in effect. These Special Conditions shall take precedence over and modify all other specification provisions to the extent in which there may be any conflict.

#### PARAGRAPH 2. DEFINITIONS, INTENT, CORRELATION, AND STREAMLINING

## 2.C(1) Modify the "Order of Precedence" as follows:

- (a) The Contract Agreement
- (b) Addenda, with those of later date having precedence over those of earlier date.
- (c) Special Conditions (or other Conditions which modify the General Conditions of the Contract).
- (d) General Conditions of the Contract
- (e) The Detailed Specification Requirements
- (f) Details appearing on the Drawings; large scale details shall take precedence over smaller scale details.
- (g) The Working Drawings; large scale drawings shall take precedence over smaller scale drawings.

### 2.C(5) Add the following:

In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

# PARAGRAPH 14. PROTECTION OF WORK AND PROPERTY

#### Add the following:

This project location/site is normally used as a U. S. Military facility.

If U. S. Military personnel are remaining in tenancy, the Contractor shall be required, for the duration of the project, to maintain the level of security that exists at the project site at the Notice to Proceed date. The Contractor shall make certain that at the end of each workday all doors, windows, walls penetrations, fencing, etc. is completely secured to prevent intruders, etc. In the event that the facility cannot be secured via Owner approved: locks, temporary partitions, etc. then the Contractor shall provide at his expense, a qualified security guard (pre-approved in writing by the Owner) to protect the site or building. Failure to maintain the security of the facility can be considered grounds for dismissal from the project.

For facilities where U. S. Military personnel are remaining in tenancy, the general operating hours of this facility are approximately 7:00 a.m. to 5:30 p.m. Tuesday - Friday. In the event that the Contractor must conduct work outside of the typical operating hours of the facility the Contractor must notify and request in writing to the Owner and Architect a minimum of five days prior to the time that Contractor desires to work. The Contractor shall not work outside typical operating hours unless it is approved, in writing, by the Owner.

The provisions in the previous two paragraphs can be modified by the Owner. These provisions may also be modified by Addenda.

The Contractor shall not permit a load to be applied, or forces introduced, to any part of the existing or new construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.

#### PARAGRAPH 19. CHANGES IN THE WORK

#### Modify per the following:

A. By mutually agreed price or prices which will be added to or deducted from the Contract Price. Additions to the contract price shall include the Contractor's overhead and profit but shall not exceed 15 percent. Where subcontract work is involved, the total mark-up for the Contractor and subcontractors shall not exceed 25%. This percentage allowance for overhead and profit shall include the cost of superintendent, timekeeper, clerks, watchmen, use of small tools, incidental job burdens, and general office expenses. There will be no additional or separate charges for these items. No allowance for overhead and profit shall be figured on any change which involves a net credit to the Owner. Changes which involve a net credit to the Owner shall include credits for overhead and profit on the deducted work.

#### PARAGRAPH 28. APPLICATIONS FOR PARTIAL AND FINAL PAYMENTS

# Add the following:

Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off site, may also be considered in Partial Applications for Payment under the following conditions:

- (1) the contractor has received written approval from the Owner to store the materials or equipment off site in advance of delivering materials to the off-site location;
- (2) a Certificate of Insurance is furnished to, and accepted by, the Owner evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored and naming the Owner as an additionally insured party:
- (3) the Architect is provided with a detailed inventory of stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect or Owner;
- (4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Owner; and
- (5) compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

# **FINAL ACCEPTANCE of the WORK**

Final Completion or Final Acceptance of the Work shall be achieved when all work including all "punch list" items recorded have been fully completed or corrected and accepted by the Owner and Architect.

#### PREREQUISITES to FINAL PAYMENT

The following conditions are prerequisites to Final Payment becoming due to the Contractor:

- (1) Full execution of the Certificate of Final Completion for the Work.
- (2) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements identified in sections 01 77 00 Project Closeout and 01 78 13 Project Closeout Checklist.

# PARAGRAPH 89. DAVIS BACON ACT

Delete this paragraph in its entirety.

# **ADD THE FOLLOWING PARAGRAPH:**

# PARAGRAPH 91. ADDITIONAL GENERAL CONTRACTOR ONE YEAR WARRANTY ITEMS

- 1. The General Contractor is required to provide the Manufacturer's recommended preventative maintenance, including inspections, for ALL items installed or refurbished in this project for a period of ONE year from the date of final acceptance.
- 2. The General Contractor will perform the preventative maintenance and inspections per Manufacturer's recommended intervals for each item.
- 3. The General Contractor will provide the Owner written documentation that the required preventative maintenance and inspections have been performed. This documentation will be provided at each Manufacturer's recommended interval and verified by the owner or tenant of each facility.

#### **END OF SECTION**

#### SECTION 01 10 00 SUMMARY OF WORK

#### **PART 1 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 work in this section.

#### 1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of work as described in the drawings and specifications entitled: Pelham Range UTES 1 Bldg. 2 Restoration - AC-22-B-0036-S, prepared by PWBA Architects, Inc., dated July 28, 2022.
- B. The types of work specified in this section include the following:
  - 1. Furnishing of all labor, materials, tools, equipment, staging areas, hoisting, qualified personnel, and proper supervision for the work described in the drawings and specifications.
  - 2. Protection of the buildings, grounds, building personnel and visitors.
- C. Work to be performed under a single prime contract.

#### 1.03 WORK UNDER OTHER CONTRACTS

- A. The Owner may at times have other work in progress at the site.
- B. Contractor shall cooperate fully with separate contractors (if any) so that work under those contracts may be carried out smoothly, without interfering with or delaying work under either contract.

#### 1.04 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have access to all areas of the building where work is to be undertaken.
- B. OWNER OCCUPANCY
  - Reference Section 00 73 00 Special Conditions of the Contract, Paragraph 14.

#### 1.05 JOB CONDITIONS

- A. Coordinate all work under this contract with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.
- B. The Contractor is responsible for the water tightness of the Existing Building during the construction contract period (after work of this contract begins). In the event the Contractor fails to maintain buildings in a watertight condition, the Contractor shall be responsible for any damage caused to the Owner's property.
- C. In the event emergency action must be taken by the Owner's maintenance forces to protect property, due to the Contractor's failure to maintain buildings in a watertight condition, the Contractor shall be responsible for all of the Owners' labor and materials cost incurred due to emergency action and he shall reimburse the Owner for such cost by standard Change Order procedure.
- D. Work under this contract must be completed in a continuous fashion. If the Contract Documents show phased work, the phasing plan must be followed, unless the Contractor has requested, and received, written approval from the Owner to deviate from the phasing plan shown in the Contract Documents.
- E. CONTRACTOR USE OF SITE AND PREMISES
  - 1. Provide access to and from site as required by law and by Owner:
    - Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
    - b. Do not obstruct roadways, sidewalks, or other public ways without permit.

SUMMARY OF WORK 01 10 00 - 1

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION

#### 3.01 WORK SEQUENCE

- A. Perform all work in not to exceed <u>410</u> Calendar Days in accordance with the following (calculated as the sum of 3.01.A.1 through 3.01.A.3. [inclusive]):
  - 1. The Notice to Proceed (NTP) is <u>14</u> Calendar Days from the email delivery of the fully executed contract to the Contractor, unless otherwise agreed upon, in writing, by the Owner and the Contractor. However, in no case will the NTP be later than December 31 of the calendar year in which the contract is executed. Contract Time begins at the NTP.
  - 2. The Contractor has <u>365</u> Calendar Days, from 3.01.A.1. (above), to perform all work. This includes providing all required operator training, the "Punch-List Inspection", correcting all deficiencies noted in the "Punch-List Inspection", and successful completion of the Final Inspection with no noted deficiencies,
  - 3. The Contractor has <u>45</u> Calendar Days, from 3.01.A.2. (above), to have submitted a complete Project Closeout package, as detailed and defined in Sections 01 77 00 and 01 78 13.

# 3.02 LIQUIDATED DAMAGES

- A. If final completion is not achieved within the time for contraction noted above, liquidated damages will be assessed in the amount of 6% per annum.
- B. The liquidated damages assessed will be deducted from the final pay application prior to payment by the Owner.

**END OF SECTION** 

01 10 00 - 2 SUMMARY OF WORK

# SECTION 01 25 13 PRODUCT SUBSTITUTION PROCEDURES

#### **PART 1 - GENERAL:**

#### 1.01 SUMMARY

- A. Section Includes: Administrative and procedural requirements for handling requests for substitutions made AFTER award of the Contract.
- B. Related Sections:
  - 1. 00 43 25 Substitution Request Form During Bidding.
  - 2. 00 72 00 General Conditions of the Contract
  - 3. 01 25 14 Substitution Request Form During Construction.
  - 4. 01 33 00 Submittal Procedures

#### 1.02 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

#### 1.03 SUBMITTALS

- A. Substitution Request Form: Submit all substitution requests using the form provided in this Project Manual. Use Section 01 25 14 Substitution Request Form During Construction.
  - Product substitutions will NOT be considered after award of the Contract unless the above substitution form is used.
  - 2. Architect will reject incomplete forms.
- B. Substitution Requests: Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number(s), Specification Section title(s), Drawing number(s), and Drawing title(s).
  - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. 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 that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to the Owner.
    - i. 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 lack of availability or delays in delivery.
    - j. Cost information, including a proposal of change, if any, in the Contract Sum.
    - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

- 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.
- 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution.

#### **PART 2 - PRODUCTS**

#### 2.01 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within twenty (20) days after Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - Requested substitution does not require extensive revisions to the Contract Documents.
  - Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.
  - 10. 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.
- C. Exceptions: The following are not considered substitutions and are not subject to requirements specified in this Section:
  - 1. Substitutions requested during the Bidding period and accepted via Addenda.
  - 2. Revisions to Contract Documents requested by the Owner.
  - Specified options on products and construction methods included in Contract Documents.

# **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION** 

# SECTION 01 25 14 - SUBSTITUTION REQUEST FORM DURING CONSTRUCTION

(Revision Date: 14 Jan 2021)

CONTRACTOR SHALL USE THIS FORM FOR SUBMITTING SUBSTITUTION REQUEST AFTER AWARD OF CONTRACT. OTHER FORMS OF SUBSTITUTION REQUESTS WILL NOT BE CONSIDERED.

Project: Project Name		Substitution Request N	lumber:
Contract #:			
Architect: Architect Name			
Architect Street Address			
City State Zip Code			
From:		_	
Re:		_	
Specification Title:			Section:
Description:		Page: Ar	ticle/Paragraph:
Proposed Substitution:			
Manufacturer:	Address:	·	Phone:
Trade Name:		Mod	el No.:
Installer:	Address:		Phone:
History: New Product	1 – 4 years old	5 – 10 years old	Exceeds 10 years old
Differences between propos		specified product:	
Point by Point comparative of	data attached:		

Reason for	not providing speci	fied item:			
Similar Insta	allation:				
Project:			Architect:		
Address:			Owner: _		
			_Date Insta	lled:	
	ubstitution affects o	<u>.</u>		Yes: Explain:	
Rough orde	r of magnitude of th	ne savings to Ov	vner for acc	epting substitution: (\$	)
Proposed su	ubstitution changes	Contract Time:	No	Yes [Add] [Deduct]	days.
su Co the	bmit a change orde ontract. Should the erefore rejected, an	r request in acc Owner reject th d the Contracto	ordance wi e change o r must com	e Owner will require the the the General Condition der request, the Substitute oly with the requirements est was rejected by the O	s of the ution Request is s of the
Supporting	Data Attached:				
Drawings	Product Data	Samples	Tests	Reports	

# 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 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 by the Contractor in all respects.

Submitted By:	Signed By:	
Firm:		
Address:		
Tolonhono		
	Fax: Website:	
Attachments:	website.	
Substitution recommended Substitution recommended	(this section to be completed by Architect/Engineer) for Acceptance by the Owner (Strikethrough if NOT applicab for Rejection by the Owner (Strikethrough if NOT applicable)  Date:	
OWNER'S REVIEW AND AC	ΓΙΟΝ (this section to be completed by Owner's KO/COR)	
	e Owner (Strikethrough if NOT applicable) Owner (Strikethrough if NOT applicable)	
Signed By:	Date:	

**END OF SECTION** 

# SECTION 01 26 00 CONTRACT MODIFICATION PROCEDURES

#### **PART 1 - GENERAL**

#### 1.01 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.

#### 1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - Specification 00 72 00 General Conditions of the Contract, Specification 00 73 00 Special Conditions of the Contract and Specification 01 26 14 Change Order Recap Form.

#### 1.03 MINOR CHANGES IN THE WORK

A. All changes in the Work will only be authorized by a fully executed Contract Modification Form, executed by both the Contractor and the Owner, or as otherwise authorized by the General Conditions of the Contract.

#### 1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - Proposal Requests issued by Owner are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - b. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. The submission shall include:
    - A list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - Indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - 3) Costs of labor directly attributable to the change.
    - 4) An updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - 5) Other requirements of the General Conditions of the Contract.
    - 6) Change Order Request Recap Form (01 26 14) completed by the Contractor.
    - Submission will be made as one complete packet, via electronic mail, to the Architect.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
  - a. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time. The submission shall include:
    - A list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

- Indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- 3) Costs of labor directly attributable to the change.
- 4) An updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 5) Other requirements of the General Conditions of the Contract.
- 6) Change Order Request Recap Form (01 26 14) completed by the Contractor.
- Submission will be made as one complete packet, via electronic mail, to the Architect.
- C. Proposal Request Form: Request for Proposal will be on Owner's approved form.

# 1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Owner will issue a Contract Modification for signatures of Owner, Surety and Contractor on Owner's "Contract Modification / Supplemental Agreement Form".

PART 2 - PRODUCTS (NOT USED)

**PART 3 - EXECUTION (NOT USED)** 

**END OF SECTION** 

# 01 26 14 CHANGE ORDER RECAP FORM

Date:		С	hang	ge Propos	al Recap	Sheet					
Contractor Name:							-				
Project Name:					Initiated By:	0	vner/Architect				
Contract Number :				-	(Check One)	O.	Contractor				
eference RFP or RFI Number:				_	(0,		Subcontractor				
				=							
rief Description of Proposed Change:	-										
	GE	NERAL CON	TRAC	TOR Direct C	ost Summar	У					
Item/Description *		Quantity	Unit			Am	ount				
item/Description		Quantity	Oilit	Unit \$	Material	Unit \$	Labor	Unit \$	Equipment		
					\$0.00		\$0.00		\$0.00		
			4		\$0.00		\$0.00		\$0.00		
			-		\$0.00		\$0.00		\$0.00		
			+		\$0.00		\$0.00		\$0.00		
			-		\$0.00 \$0.00		\$0.00 \$0.00		\$0.00 \$0.00		
			+		\$0.00		\$0.00		\$0.00		
			+		\$0.00		\$0.00		\$0.00		
			+		\$0.00		\$0.00		\$0.00		
				Sub Totals	\$0.00		\$0.00		\$0.00		
				-							
Material:	\$0.00		-								
Labor:	\$0.00										
Equipment:  Prime Contractor Subtotal:	\$0.00 \$0.00	. •									
Prime Contractor Subtotal.	φ0.00										
		SUBCONTR	ACTOF	R Direct Cost	Summary						
Item/Description *		Quantity	Unit				ount				
·			+	Unit \$	Material \$0.00	Unit \$	Labor \$0.00	Unit \$	Equipment \$0.00	Unit \$	<b>Sub-sub</b> \$0.00
			+		\$0.00		\$0.00		\$0.00		\$0.00
			+		\$0.00		\$0.00		\$0.00		\$0.00
					\$0.00		\$0.00		\$0.00		\$0.00
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				Sub Totals	\$0.00		\$0.00		\$0.00		\$0.00
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Labor:											
Equipment:											
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# **Armory Commission of Alabama**

REQUEST FOR INFORMATION FORM				
CONTRACTOR:	PROJECT:			
RFI#:	DATE:			
TO / ATTN:	FROM:			
DESCRIPTION:				
DRAWING NUMBER:	SPEC SECTION:			
DESCRIPTION OF RFI:				
RECOMMENDED SOLUTION BY GC:				
SIGNATURE:				
SCHEDULE IMPACT: YES NO UNKNOWN	RESPONSE REQUIRED: YES NO			
COST IMPACT:   YES  NO  UNKNOWN	REST ONSE REQUIRED.			
RECOMMENDATION OR RESPONSE:				
SIGNATURE:	DATE:			

# SECTION 01 29 00 PAYMENT PROCEDURES

#### **PART 1 - GENERAL**

#### 1.01 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.

#### 1.02 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 01 31 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.
  - 3. Section 00 62 76 "Contractor's Periodical Request for Partial Payment"

#### 1.03 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.

#### 1.04 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. Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect in accordance with the requirements of the requirements of the Addenda and concurrent with both the initial Contractor's Draw Schedule (Section 00 62 83) and Contractor's Progress Schedule (Section 01 32 00).
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Utilize the Contractor's Periodical Request for Partial Payment form at Specification 00 62 83 for the Schedule of Values.
  - 2. 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. Provide several line items for principal subcontract amounts, where appropriate or as directed by the Owner.
  - 3. To the greatest extent possible, round amounts to nearest whole dollar; total shall equal the Contract sum.
  - 4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - Differentiate between items stored on-site and items stored off-site per 00 62 78.
  - Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

PAYMENT PROCEDURES 01 29 00 - 1

- 6. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the allowance quantity. Use information indicated in the Contract Documents to determine quantities.
- 7. Alternates: Provide a separate line item in the Schedule of Values for each alternate.
- 8. There shall be a separate line in the amount of 2.5% of the Contract, as awarded, included on the Schedule of Values and titled "Closeout Documents."
- 9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

# 1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as checked by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Completion, and Final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use Owner provided "Contractor's Periodical Request for Partial Payment" and Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. NOTE: If the Application is not signed by the person who submitted the Bid, the Architect and/or Owner reserve the right to reject the Application, unless and until the Contractor shall have provided the Owner a letter authorizing additional signatories, on Contractor's letterhead, and that Owner has accepted. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three, signed in blue ink and notarized, original copies of each Application for Payment to Architect at the next Owner-Architect-Contractor (OAC) meeting. Include waivers of lien and similar attachments as required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Initial Application for Payment: Administrative actions and submittals, to include Owner's acceptance, that must precede submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of Values.
  - 3. Contractor's Construction Schedule.
  - 4. Submittals Schedule (preliminary if not final).
  - 5. List of Contractor's principal consultants.
  - 6. Initial settlement survey and damage report if required.
- G. Periodic Applications for Payment: Administrative actions and submittals that must coincide with submittal of each Application for Payment include the following:
  - 1. Contractor's Periodical Request for Partial Payment.
  - 2. Submittals Schedule (updated).
  - Inventory of Stored Materials submitted on form provided in Specification Section 00 62 78.

- 4. Contractor's Draw Schedule on form provided in Specification Section 00 62 83.
- 5. Weather Delay Documentation Form as provided in Specification Section 00 63 56.
- 6. Updated LEED Scorecard (if Applicable)
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation showing 100 percent completion for portion of the Work claimed as complete, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 3. Updated final statement, accounting for final changes to the Contract Sum.
  - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  - 6. AIA Document G707, "Consent of Surety to Final Payment."
  - 7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Final Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  - 8. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

**PART 3 - EXECUTION (NOT USED)** 

# SECTION 01 31 00 PROJECT MANGEMENT AND COORDINATION

#### **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section Includes: Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
- B. Related Sections:
  - Section 01 32 00 Construction Progress Documentation: Preparing and submitting Contractor's Construction Schedule.
  - 2. Section 01 73 00 Execution: Procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 01 77 00 Closeout Procedures: Coordinating Contract closeout.

#### 1.02 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - Schedule construction operations in the 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 assure manufacturers and applicable code(s) [whichever is greater] accessibility for required maintenance, service, and repair.
  - 3. Make provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
  - 1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Pre-installation conferences.
  - 7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

# 1.03 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil/site, mechanical, plumbing, and electrical systems.
    - b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
  - 3. Number of Copies: Submit two opaque copies of each submittal. Architect will return one copy.
  - Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
  - 1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

#### 1.04 PROJECT MEETINGS

- General: Architect will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - Attendees: Architect will inform participants and others involved, and individuals
    whose presence is required, of date and time of each meeting. Architect will notify
    Owner and Contractor of scheduled meeting dates and times.
  - Agenda: Contractor will prepare and distribute the meeting agenda to all invited attendees.
    - Contractor shall provide Architect and Owner with agenda items 48 hours before the Project Meeting.
  - 3. Minutes: Contractor will record significant discussions and agreements achieved. Meeting minutes will be distributed to everyone concerned, including Owner and Architect, within three (3) days of the meeting.
- B. Preconstruction Conference: Owner will schedule a preconstruction conference before starting construction, at a time convenient to Architect and Contractor, after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
  - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing Change Order Requests and Contract Modifications.

- f. Procedures for requests for information (RFIs) utilizing the form in Section 01 26 20.
- g. Procedures for testing and inspecting.
- h. Procedures for processing Applications for Payment.
- i. Distribution of the Contract Documents.
- j. Submittal procedures.
- k. LEED requirements (if applicable).
- I. Preparation of Record Documents.
- m. Use of the premises and existing building(s).
- n. Work restrictions.
- o. Owner's occupancy requirements.
- p. Responsibility for temporary facilities and controls.
- q. Construction waste management and recycling.
- r. Parking availability.
- s. Office, work, and storage areas.
- t. Equipment deliveries and priorities.
- u. First aid.
- v. Security.
- w. Progress cleaning.
- x. Working hours.
- 3. Minutes: Architect will record and distribute meeting minutes.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
  - Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related requests for interpretations (RFIs).
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - I. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.

- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at regular intervals (at least monthly) scheduled with the Owner and Architect, otherwise known as Owner-Architect-Contractor (OAC) meetings. Coordinate dates of meetings with preparation of payment requests.
  - Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting.

      Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Requests for information (RFIs).
      - 16) Status of proposal requests.
      - 17) Pending Change Order Requests.
      - 18) Status of Contract Modifications.
      - 19) Pending claims and disputes.
      - 20) Review of executed Periodical Requests for Partial Payments.
  - 3. Minutes: Contractor will record the meeting minutes.
  - 4. Reporting: Not later than 3 days after each meeting, 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: Update 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

#### **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section Includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule.
  - 2. Submittals Schedule.
  - 3. Daily construction reports.
  - 4. Field condition reports.

#### B. Related Sections:

- 1. Section 01 29 00 Payment Procedures: Submitting the Schedule of Values.
- 2. Section 01 31 00 Project Management and Coordination: Submitting and distributing meeting and conference minutes.
- 3. Section 01 33 00 Submittal Procedures: Submitting schedules and reports.
- 4. Section 01 40 00 Quality Requirements: Submitting a schedule of tests and inspections.

#### 1.02 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: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- C. Major Area: A story of construction, a separate building, or a similar significant construction element.

#### 1.03 SUBMITTALS

- A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Architect's final release or approval.
- B. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.

# 1.04 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- 3. Coordinate Contractor's Construction Schedule with the Schedule of Values (01 29 00) and Contractors Draw Schedule (00 62 83), list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  - Secure time commitments for performing critical elements of the Work from parties involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

#### **PART 2 - PRODUCTS**

#### 2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  - Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

# 2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the NTP 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 story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Owner.
  - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  - Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  - 4. Startup and Testing Time: Include not less than three (3) days for startup and testing.
  - 5. Project Completion: Indicate completion in advance of date established for Project Completion, and allow time for Architect's administrative procedures necessary for certification of Project Completion.
- 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.
  - 1. Phasing: Arrange list of activities on schedule by phase.
  - Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Final Acceptance.
    - e. Use of premises restrictions.
    - f. Provisions for future construction.
    - g. Seasonal variations.
    - h. Environmental control.
  - 4. Work Stages: Indicate important stages of construction for each major portion of the Work.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Punch List Inspection, and Final Inspection.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

# 2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format. Submit two (2) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- B. CPM Schedule: Submit Contractor's Construction Schedule, simultaneously with the Schedule of Values (01 29 00) and the Draw Schedule (00 62 83), using a computerized, time-scaled CPM network analysis diagram for the Work in accordance with General Conditions, Article 9.
  - 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 Owner's approval of the schedule.
  - 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- C. 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.
    - Testing and commissioning.
  - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. 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. Immediate preceding and succeeding activities.
  - 5. Early and late start dates.
  - 6. Early and late finish dates.
  - 7. Activity duration in workdays.
  - 8. Total float or slack time.
  - 9. Average size of workforce.
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

- 1. Identification of activities that have changed.
- 2. Changes in early and late start dates.
- 3. Changes in early and late finish dates.
- 4. Changes in activity durations in workdays.
- 5. Changes in the critical path.
- 6. Changes in total float or slack time.
- 7. Changes in the Contract Time.

#### 2.04 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. List of subcontractors at Project site.
  - 2. Equipment at Project site.
  - 3. Material deliveries.
  - 4. High and low temperatures and general weather conditions.
  - Accidents.
  - 6. Stoppages, delays, shortages, and losses.
  - 7. Meter readings and similar recordings.
  - 8. Orders and requests of authorities having jurisdiction.
  - 9. Services connected and disconnected.
  - 10. Equipment or system tests and startups.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

#### **PART 3 - EXECUTION**

# 3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- 3. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

# SECTION 01 33 00 SUBMITTAL PROCEDURES

#### **PART 1 - GENERAL:**

#### 1.01 SUMMARY

A. Shop Drawings and samples shall be properly identified by project name, description or names of equipment, materials, and items, and complete identification of locations at which materials or equipment are to be installed.

#### 1.02 SHOP DRAWINGS

- A. Submit Shop Drawings for all items called for in the detail Specifications. Submit a minimum of six (6) black line prints of each Drawing, unless otherwise specified in the detail Specifications. Two prints of each Drawing will be retained by the Architect, the remaining prints will be returned to the Contractor. One print of each Drawing, bearing the final approval stamp of Architect, shall be kept at the project office, and shall be maintained in good condition. No Shop Drawings other than those stamped "Approved" shall be on the job for any purpose and any work installed incorrectly from any Shop Drawing shall be removed and corrected at no change in contract price.
- B. Approval will be for general design only and will not relieve Contractor from responsibility for errors or omissions in Shop Drawings, even though same were not indicated when approved.
- C. In checking Shop Drawings, The Architect shall not be required to check dimensions, quantities, electrical characteristics, specific capacities, or coordination with other trades, these being the responsibility of the Contractor. Contractor shall attest, either in writing, by stamp, or signature, that all Shop Drawings submitted for approval have been checked for compliance with the Drawings and Specifications prior to submissions to the Architect otherwise they will be returned unchecked.
- D. No Shop Drawings shall be submitted directly to the Architect from a manufacturer, jobber, or sub-contractor. All submittals shall be through the General Contractor.
- E. Approvals shall not be construed as approved departure from Contract Drawings and Specifications.

# 1.03 SAMPLES

- A. Furnish all samples called for in the detail Specifications and such other samples as the Architect may direct.
- B. Samples or color selections shall include a complete selection of available colors and finishes. After Owner has selected colors and finishes, submit four additional samples of the selected colors and finishes which will become a master color guide to be used throughout the progress of the work.

#### 1.04 SUBMISSION

- A. Submission of Shop Drawings and samples shall be by a transmittal letter, in duplicate, containing project name, Contractor's name, Sub-contractor's and/or Vendor's name, a complete listing of Drawings or Samples submitted, and other pertinent data.
- B. Samples of materials in connection with mechanical and electrical work may not be submitted to the Engineer. All samples of materials are to be submitted to the Architect.
- C. Samples for the selection of colors and finishes shall be made in one submittal. No color selections will be made until samples on all items requiring color selection have been submitted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# SECTION 01 40 00 QUALITY REQUIREMENTS

# **PART 1 - GENERAL**

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Quality Control Requirements.
  - Administrative and procedural requirements for quality assurance and quality control.

# B. Related Sections:

- Section 01 32 00 Construction Progress Documentation: Developing a schedule of required tests and inspections.
- 2. Section 01 73 29 Cutting and Patching: Repair and restoration of construction disturbed by testing and inspecting activities.
- 3. Divisions 02 through 33 Sections: Specific test and inspection requirements.

#### 1.02 QUALITY CONTROL REQUIREMENTS

- A. General: The Contractor shall establish a system of inspections and tests of his work and that of his subcontractors to ensure that all applicable requirements of the specifications are met.
  - 1. The Contractor shall be diligent to ensure that the quality of workmanship is satisfactory, that dimensional requirements are met, that defective materials are not used and that all required control and laboratory testing procedures are effected.
  - 2. Where specific testing procedures are not stipulated, the Contractor shall establish and conduct a test procedure to ensure adherence to specified quality.
  - The Contractor shall make an initial inspection of each phase of work as soon as a
    representative portion has been completed, and the Contractor shall make daily followup inspections, to ensure that an acceptable quality of work is established and
    maintained.
  - 4. The Contractor shall perform a pre-final inspection and work off all punch list items prior to Architect's or Owner's inspection(s).

#### 1.03 DEFINITIONS

- A. Conventional Inspections: Inspections, not specifically required by Code, which are considered essential to the proper performance of the building systems.
- B. Inspections: Evaluation of systems, primarily requiring observation and engineering judgment.
- C. Quality-Control Services: Conventional inspections, special inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. Services do not include contract enforcement activities performed by Architect.
- D. Special Inspections: Inspections, required by Code, which monitor the quality of materials and workmanship critical to the structural integrity of the building.
- E. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- F. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- G. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

- H. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- 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 and the Owner, to establish product performance and compliance with industry
  standards.
- J. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- K. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- L. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- M. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- N. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.04 QUALITY ASSURANCE AND CONTROL SERVICES REQUIREMENTS

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

#### 1.05 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement, unless directed otherwise by the Owner. Refer uncertainties and requirements that are different, but apparently equal, to the Architect, in writing, for the Owner's decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect, in writing, for the Owner's decision before proceeding.

#### 1.06 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 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.
  - Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and re-inspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

# 1.07 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

- G. 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.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - Obtain Architect's approval of mockups before starting work, fabrication, or construction.
  - Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed, unless otherwise indicated.

#### 1.08 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  - 2. Payment for these services will be made from allowances, as authorized by the Owner.
  - 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 Modification.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction, at no additional expense to the Owner or Architect. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 1. Where services are not indicated as Owner's responsibility, engage a qualified testing agency to perform these quality-control services.
  - 2. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 3. Notify testing agencies and Architect at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  - 4. For all quality-control services that are not indicated as Owner'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.
- 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 01 33 00 Submittal Procedures.
- D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect, Owner, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required qualityassurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

#### 1.09 STANDARD AND INDUSTRY SPECIFICATIONS

- A. Any material or operation specified by reference to the published specification of a manufacturer, The American Society for Testing and Materials (ASTM), The American Standards Association (ASA), Federal Specifications, or other published standard shall comply with the requirements of the current specification or standard listed. Should there be a discrepancy between the referenced specification and the contract documents the latter shall govern unless written interpretation is obtained from the Owner. Should there be discrepancies among referenced specifications or standards, the more stringent requirements shall govern.
- B. The Contractor shall, if requested, furnish an affidavit from the manufacturer(s) certifying that the materials or products being furnished meet the requirements specified. Such certification, however, shall not relieve the Contractor from the responsibility of complying with other requirements of the contract documents.

# 1.10 MANUFACTURER'S DIRECTIONS

A. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturers unless herein specified to the contrary. Should there be a discrepancy between an installation as required by the drawings and/or specifications and the manufacturer's directions and/or recommendations, such discrepancy shall be brought to the attention of the Architect and shall be resolved before the work may proceed.

#### 1.11 APPROVED MATERIAL REQUIREMENTS

A. In the event the architectural, plumbing, mechanical and/or electrical requirements of any "APPROVED" material is different from that specified and/or as indicated on the drawings, any additional cost involved shall be the responsibility of the Contractor. No extra cost to the Owner or Architect will be allowed because of the use of such materials.

#### 1.12 USE OF FOREIGN MATERIALS

A. The Contractor shall agree to use in the execution of this contract only materials, supplies, and products manufactured, mined, processed or otherwise produced in accordance with the Buy American Act (41 USC 10a-10d).

# 1.13 EXAMINATION OF SURFACES AND/OR CONDITIONS

A. The Contractor shall examine all surfaces on which, or against which, their work is to be applied and shall notify the Architect in writing of any defects the Contractor may discover which, in the Contractor's opinion, would be detrimental to the proper installation or operation of the Contractor's products. Commencing of work by the Contractor denotes acceptance by Contractor of all surfaces and conditions affecting Contractor's work.

#### PART 2 - PRODUCTS (NOT USED)

#### **PART 3 - EXECUTION**

#### 3.01 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Comply with the Contract Document requirements for Section 01 73 29 Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

# SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

#### **PART 1 - GENERAL**

#### 1.01 TEMPORARY OFFICES AND SHEDS

- A. At the Contractor's Option, he may provide an office, storage sheds, and other structures as may be necessary to carry on the work.
- B. Storage sheds shall be of sufficient size to hold materials required on the job site at one time, and shall have floors raised at least 1'-0" above the ground on heavy joists or sleepers. Sheds shall be watertight.

# 1.02 TELEPHONE (CONTRACTORS OPTION)

A. The Contractor may install, at his own expense, a single party job telephone, which shall be available for the use of all persons concerned with the construction of the project. All official long distance calls shall be paid by the General Contractor.

# 1.03 TOILET FACILITIES

- A. The Contractor shall, at the beginning of the work, provide on the premises toilet facilities and enclosures for the use of all workmen on the project; shall maintain same in a sanitary condition; and shall remove same at the completion of the building and/ or when directed by the Architect or Owner.
- B. The toilets shall, in construction details, equipment connections, and maintenance conform to all rules, regulations, and requirements of the City or County Health Department having jurisdiction.

#### 1.04 RODENT AND VERMIN CONTROL

A. The Contractor shall provide on the job site ample and suitable containers with covers, and shall be fully responsible for containing and removing from the site all refuse from meals eaten on the site and other rodent or vermin attracting refuse. If the Contractor has the entire site the Contractor is solely responsible for ensuring that the site is rodent and vermin free at the Final Inspection.

#### **1.05 SIGNS**

A. No signs will be allowed on the premises except as required by the project specifications and/or as approved by the Owner.

#### 1.06 PROTECTION

- A. Provide and maintain all fences, planking, bridges, bracing, shoring, sheet piling, lights, barricades, warning signs, and guards as necessary for the protection of streets, sidewalks, landscaping, adjoining property, and the streets adjacent.
- B. Provide protection for all shrubs, trees, lawns, walks, roads, drives, adjacent buildings and equipment, both on and off property, and in roads and streets adjacent.

### 1.07 REMOVAL

A. Temporary facilities shall be removed promptly as each becomes no longer required, but in all cases no later than the date of Final Acceptance.

#### 1.08 STORAGE AND PARKING AREA

A. The amount of area and location that may be used for parking, storage of materials, equipment, sheds, and offices shall be as indicated by the Drawings or as directed by the Owner.

# 1.09 FIRST AID PROTECTION

- A. General Contractor shall provide the following:
  - 1. First Aid Accident Cabinets.
  - 2. Emergency telephone numbers posted at telephone.

#### 1.10 FIRE PRECAUTION DURING CONSTRUCTION

A. Emergency fire protection shall be provided for temporary sheds, new work, stacked materials, etc., using extinguishers, water pails and small hose streams, said equipment conforming to the requirements of the National Board of Fire Underwriters and relevant Insurance Co. Particular care shall be exercised when using open flame and welding and cutting equipment; use only flameproof type tarpaulins. Keep site clean and orderly with proper protection of combustibles while in use and in storage.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# SECTION 01 57 13 TEMPORARY EROSION CONTROL

#### PART 1. GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. It will be the contractor's responsibility to obtain an N.P.D.E.S Construction Stormwater Permit through the Alabama Department of Environmental Management, including all applicable fees should total disturbance exceed 1 acre. Contractor to construct and maintain the BMP Plan for all erosion control measures at this site. Any fines issued by the Alabama Department of Environmental Management due to inadequate BMP's and/or erosion control shall be the contractor's responsibility to pay.
- B. The requirements of this Section do not relieve the Contractor of responsibilities for work covered under other Sections of the specifications. The erosion control measures required herein shall be coordinated with the permanent erosion control features of the project to assure effective continuous erosion control.
- C. The general requirements for work performed hereunder are indicated on the Drawings and herein. However, it shall be the responsibility of the Sitework Contractor to prepare a complete and comprehensive erosion control plan which may incorporate the ideas presented herein, or which may be a completely new approach.

#### 1.03 DEFINITIONS

- A. Temporary erosion controls include, but are not limited to, mulching and grassing, temporary site work, structures and/or other facilities which will ensure that erosion during construction will be controlled within acceptable limits as established by regulations of local, state and federal authorities.
- B. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sediment will be captured prior to entering the existing storm drainage system, stream or other runoff facility.

# 1.04 SUBMITTAL

A. Submit the erosion control plan for review and approval prior to commencement of any work. Include any and all phasing requirements. Make timely revisions if and as required due to unforeseen circumstances.

#### 1.05 QUALITY ASSURANCE

- A. Applicable Standards: Compliance with all erosion control ordinances and regulations of local, state and federal governments is required.
- B. Quality Control: Make inspections of all facilities immediately after beginning each new construction activity, after each weather disturbance and not less than weekly. Record reports of

all such inspections and make them available to the Owner.

#### 1.06 SEQUENCING AND SCHEDULING

- A. Plan Implementation: The Contractor's approved Erosion Control Plan shall be implemented at the beginning of construction and maintained during the entire life of the Contract. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and sedimentation are to be identified and receive special attention.
- B. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the length of time of exposure. All such activities are to be planned and conducted so as to minimize off-site sedimentation damage.

#### **PART 2 PRODUCTS**

#### 2.01 MATERIALS, GENERAL

A. Provide products as indicated herein or on Drawings and as necessary to achieve erosion control objectives.

# **PART 3 EXECUTION**

#### 3.01 EROSION CONTROL TECHNIQUES

- A. Temporary Stabilization of Entrances to Construction Sites: Stabilize defined entrance ways using stone complying with requirements of ASTM C-33 No. 2 (1-1/2" to 2-1/2") and filter fabric conforming to AASHTO M-288 and Sec. 810 of the Alabama Department of Transportation Specification.
- B. Stabilized area shall be as indicated on the drawings; if not indicated, the area shall be at least 25' wide and at least 6" thick.
- C. Maintain the entrance way in such a manner as to prevent tracking or flowing of sediment onto existing paved road. This may require periodic additional top dressing of stone as conditions demand. Repair and/or clean out all facilities employed to trap sediment. Immediately clean up and remove all sediment spilled, dropped, washed or tracked onto pavement.
- D. Runoff Control: Surface water runoff originating upgrade or from exposed areas shall be controlled by the use of diversion ditches (berms), interceptor dikes, sediment basins and drains silt, fences, etc., or a combination of several or all to reduce erosion and sediment loss during the period of exposure. In addition, use of temporary seeding, mulching, erosion control netting, hay bales, sand bags, check dams and rip-rap may be employed.
- E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity causes accelerated erosion of the receiving facility, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the facility. This may be accomplished through the use of check dams or other energy dissipation devices.
- F. Diversion Ditches: Provide diversion ditches where required, utilizing cut and fill techniques as specified in Section Earthwork. Compaction shall be sufficient to withstand normal runoff rates and amounts for the area according to current weather records.
  - 1. Maintain ditches during the construction period and remove at the completion of the permanent placement of structures and erosion control facilities.

- G. Sediment Basins and Drains: Construct sediment basins and drains as required.
  - 1. Maintain the system and remove all sediment when the facility is filled to half capacity, and remove the system at the termination of the construction period.
- H. Silt Fence: Using materials shown on the drawings, construct fences where required, as detailed.
  - 1. Continuously maintain fence during the construction period and remove when all structures and permanent planting, etc. is in place.
- I. Temporary Grassing: Using materials listed below, plant temporary grass as a measure of temporary erosion control.

Season/Seed:	Rate Per Acre:
September through December Abruzzi Rye Kentucky 31 Fescue	70# 30#
January through April Kentucky 31 Fescue Reseeding Crimson Clover	30# 30#
April through August Brown Top Millet Kentucky 31 Fescue	30# 30#

- 1. Scarify slopes to a depth of not less than 3 inches and remove large clods, rocks, stumps, roots (larger than 1/2" diameter) and debris. Sow seed within 24 hours after the ground is scarified, with either mechanical seed drills or rotary hand seeders.
- 2. Apply mulch and netting (as specified below) over all seeded areas.
- 3. Use a common 10-10-10 mixture at a rate of 1000#/acre. Repeat application every three months.
- 4. All seeded areas shall be immediately and periodically watered until a minimum growth of 3 inches above the ground surface is evident. Necessary measures to provide and maintain a quick and satisfactory growth will be required.
- 5. When all construction is complete, provide permanent grassing as specified.
- J. Filter Fabric: Where shown on drawings or where otherwise required, provide filter fabric. Install as detailed. The following products are approved (others may be approved upon 10 day prior-to-bid request):

Enkamat by American Enka Co., Enka, NC

Typax 3400 Series by DuPont, Wilmington, DE

Miramat by Mirafi, Charlotte, NC

Bituminous treated glass fiber, conforming to Alabama Department of Transportation Std. Spec. for Road and Bridge Construction.

- 1. Maintain the filter fabric for the duration of the construction period, removing same at the conclusion thereof.
- K. Temporary Mulching: Mulching shall be provided where required; material shall be either

thrashed rye, oat or wheat straw, placed loosely in a thickness of 3/4" to 1-1/2". Where so noted, mulch shall be secured by a biodegradable erosion control netting held in place by wooden stakes.

- 1. Maintain the system as necessary for the entire construction period and remove the stakes and turn under the mulch and netting prior to installation of permanent grassing.
- L. Straw Bale Barriers: Excavation for straw bale barriers shall be to the width of the bale and length of the proposed barrier to a minimum depth of 4 inches. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.
  - 1. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale. Gaps between bales shall be filled by wedging straw to prevent sediment from penetrating between the bales.
  - 2. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 inches on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.
  - 3. To protect inlets, excavate earth around inlet to a minimum depth of 4 inches and to accommodate the width of the bale. Place bales lengthwise in a single row surrounding the inlet. Adjacent bales shall be pressed together and loose straw shall then be wedged between them to prevent sediment from entering between the bales.
  - 4. To hold the bales in place, drive at least 2 stakes or rebars through each bale in opposing directions. Backfill shall be placed and compacted against the straw barrier, using the soil from the excavation.
  - 5. Silt fencing may be used in lieu of hay bales for inlet protection.
  - 6, Provide the necessary maintenance during the construction period and remove barrier and drain prior to grassing and other planting.

#### 3.02 MAINTENANCE

A. Maintenance and Removal of Facilities: During the construction period, the Contractor shall be responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one half. Contractor shall maintain all erosion control systems and facilities.

#### 3.03 CLEAN UP

A. Final Cleanup: Remove all temporary erosion control systems and facilities as the need for them is terminated. All control then shall be accomplished by in-place permanent systems. Dispose of all debris in a legal manner.

# SECTION 01 60 00 PRODUCT REQUIREMENTS

#### **PART 1 - GENERAL**

#### 1.01 PRODUCTS AND MATERIALS

A. Products, Materials, and manufactured items or articles of like nature, shall as nearly as possible, be of one brand or manufacturer. No changes or substitutions shall be made without written consent of the Owner.

#### 1.02 TRADE NAMES

A. The use of manufacturer's names and model numbers are given to establish a standard of manufacture and not intended to be restrictive or preferential. Similar, equal, and approved materials of other manufacturers will be acceptable, subject to the approval of the Owner, pursuant to requirements set forth in Instruction to Bidders and as required by the Specifications.

#### 1.03 MEASUREMENTS

A. Before ordering any material or doing any work, the Contractor shall verify all measurements of the building and shall be responsible for correctness of same. No extra charge or compensation will be allowed because of differences between actual measurements and the dimensions indicated on the Drawings. Any Differences which may be found, shall be submitted to the Architect for consideration before proceeding with the work.

#### 1.04 SALVAGEABLE MATERIAL

A. Any salvageable material and or equipment shall remain the property of the Owner and upon removal from its existing location shall be stored where directed by the Owner. In the event that the Owner does not wish to keep the salvaged material, it shall be the responsibility of the Contractor to remove same promptly form the site.

#### **PART 2 - PRODUCTS**

# 2.01 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
- B. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
- C. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- D. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where products are accompanied by the term "as selected," Architect will make selection.
- F. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
- G. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- H. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- I. Product and Manufacturer Source: Where specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product names, unless otherwise indicated.

#### 2.02 PRODUCT SUBSTITUTIONS

- A. Proposed Substitutions During Bidding: In the technical sections of the specifications under Products heading, where only one manufacturer's specific data including material, model, specification, finish, color, or other specific identification is noted, it is to indicate standards required and that manufacturer's data is automatically approved. If other manufacturers propose to bid on the work, including any other manufacturer listed in the specification section as a manufacturer, the Bidder shall submit full data to the Architect no later than 10 days prior to bid date and shall gain specific approval, via Addendum, on specific products prior to bidding. In the event submitted data of any manufacturer gains approval through this method, the manufacturer and the specific products will be published in an addendum prior to bid date. Only manufacturer's products listed in the original specifications or listed as approved in a subsequent addendum shall be used on the project. No other manufacturers or their products will be considered without prior written consent from the Owner.
- B. Proposed Substitutions After Commencement of the Work: Requests received during construction may be considered only when all the following specific conditions are satisfied. IF the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- C. Submission, and approval of, Substitution Request Form During Construction 01 25 14.
  - 1. None of the approved products of the specified type are available.
  - 2. Requested substitution has been coordinated with other portions of the Work.
  - 3. Requested substitution provides specified warranty.
  - 4. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (NOT USED)

# SECTION 01 73 00 EXECUTION

#### **PART 1 - GENERAL**

#### 1.01 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.

#### 1.02 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. General installation of products.
  - 3. Progress cleaning.
  - 4. Starting and adjusting.
  - 5. Protection of installed construction.
  - 6. Correction of the Work.
- B. Related Sections include the following:
  - 1. 01 31 00 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. 01 33 00 "Submittal Procedures" for submitting surveys.
  - 3. 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

# PART 2 - PRODUCTS (NOT USED)

#### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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- 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
- 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

#### 3.02 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, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

#### 3.03 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling.
- 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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. 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.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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

# 3.04 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.
  - Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. 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 (27 deg C).
  - 3. 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.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Final Acceptance.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- 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.

# 3.05 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

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#### 3.06 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Final Acceptance.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

#### 3.07 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
  - Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

#### **END OF SECTION**

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## SECTION 01 73 29 CUTTING AND PATCHING

## **PART 1 - GENERAL**

## 1.01 CUTTING AND PATCHING PROPOSAL:

- A. Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include a description of cutting and patching and changes to existing construction, a list of products to be used and firms or entities that will perform the Work, dates when cutting and patching will be performed, and a list of utilities that cutting and patching procedures will disturb or affect.
- B. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  - 1. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.
- C. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- D. 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.
- E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
  - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
- F. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL:

- A. Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## **PART 3 - EXECUTION**

## 3.01 EXAMINATION

- Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
- B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- E. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas or the remainder of the building(s).
- G. Performance: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - Cut existing 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.
- H. Cutting: Cut existing 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.
  - In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- I. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 4. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an evenplane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

## SECTION 01 77 00 PROJECT CLOSEOUT

## **PART 1 - GENERAL:**

#### 1.01 SUMMARY

A. The work under this Section consists of, but is not limited to; Submittals, Requirements and Procedures for Project close out.

#### 1.02 RELATED SECTIONS

- A. Section 01 33 00 Submittal Procedures
- B. Section 01 78 13 Project Closeout Checklist
- C. Section 00 65 20 Final Completion Form

## 1.03 SUBMITTALS

- A. Construction Completion Requests
  - 1. Certificate of Final completion
  - 2. Final Inspection
- B. Close out Submittals: Three printed (hard) copies and three electronic copies in Adobe PDF format on CD or DVD-5 of close out submittals of which receipt and acceptance are prerequisites for final payment shall include, but not necessarily be limited to, the following:
  - 1. Affidavit of "Advertisement of Completion". Refer to Section 00 65 13.
  - 2. Evidence of Payments, and Release of Liens.
  - 3. General Contractors "One Year Guarantee".
  - 4. General Contractors "State of Alabama Roofing Guarantee". Refer to Section 00 65 36 (If Applicable).
  - 5. Final Application for Payment.
  - 6. All required warranties and guarantees.

## 1.04 PUNCH LIST

- A. Any salvageable material and or equipment shall remain the property of the Owner and upon removal from its existing location shall be stored where directed by the Architect. In the event that the Owner does not wish to keep the salvaged material, it shall be the responsibility of the Contractor to remove same promptly from the site.
- B. Inspection:
  - 1. Prior to completion of the project, the Contractor shall fully prepare their own written Punch List. Upon completing correction of all Contractor generated Punch List items, the Contractor shall forward to the Owner and Architect a copy of their Punch List along with written notification that they have completed their entire list of items and are requesting a formal Punch List inspection.
  - 2. When the Owner confirms the Inspection date and time, the Architect will notify all parties in writing via e-mail the confirmed date and time for the Inspection. Cancellations of any scheduled Inspection must be received in writing no later than 48 hours prior to the scheduled Inspection. If the Inspection is canceled, it will be rescheduled subject to the Owner and Architect's availability. Cancellations received less than 48 hours in advance shall incur a minimum \$1,500.00 re-inspection fee.
  - 3. The Contractor is responsible for ensuring they and all their Sub-Contractors are completely ready for all Commissioning Activities and Inspections. If the Contractor and /or any of their associated Sub-contractors are not ready, then the Owner reserves the option to deduct from the Contractor all costs for the A/E team and Owner team participation due to failure of the Contractor and/or their Sub-contractors to be ready for Commissioning Activities or Inspections.
- C. Rejection of Certification by Contractor:

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Should the Architect consider that work is not complete he will, on completion of
inspection, immediately notify Contractor, in writing, stating reasons. Contractor shall
complete work and send second written notice to the Architect certifying that project, or
designated portion of project, is complete, after which the Architect and Owner
representative will inspect work.

### 1.05 FINAL INSPECTION

- A. Certification: Contractor shall submit written certification that: Contract Documents have been reviewed; project has been inspected for compliance with Contract Documents; Work has been completed in accordance with Contract Documents; Equipment and Systems have been tested in presence of Owner's Representative and are operational and Project is completed and ready for final inspection.
- B. Inspection: Architect and Owner will make final inspection of the project within a reasonable time after receipt of certification. Should Owner consider that work is in fact complete in accord with requirements of Contract Documents, he will request Contractor to make Project Closeout Submittals. Should Owner consider that work is not complete, he will notify Contractor, in writing, stating reasons. Contractor shall take immediate steps to remedy stated deficiencies, and send second written notice to Architect certifying that work is complete. The Architect and Owner will re-inspect the work.
- C. Certificate of Final Completion: Should the Owner consider that work is complete:
  - 1. Architect will prepare and issue a Certificate of Final Completion, or approved equal, complete with signatures of Owner and Contractor.
  - For Owner occupancy of Project or designated portion of project, Contractor shall: perform final cleaning; and Contractor shall complete work listed for completion or correction, within designated time.

# 1.06 AS-BUILT DRAWINGS

- A. Upon completion of this contract, the Contractor shall deliver to the Owner, at the Final Inspection, the three complete sets of legible drawings which vary from the original contract documents, showing all construction equipment, mechanical and electrical systems and connections as installed or built. All lettering and drawings shall be neat and recorded in permanent ink. The record drawings shall be supplemented by detailed sketches or drawings when necessary. "As-Built" Drawings not legible shall be completely redone.
- B. The Owner shall approve Record Drawings and shall be the sole judge of the acceptability of the Drawings.
- C. Submit three electronic copies of all as built documents in Adobe PDF format on CD or DVD-5, simultaneous with the Closeout Documents.

## 1.07 OPERATION AND MAINTENANCE DATA

- A. If applicable furnish three (3) complete sets of manuals containing manufacturer's instructions for operation and maintenance of each item of equipment and apparatus furnished under the Contract, detailed parts list and any additional data specifically required under various sections of the Specifications. Manuals shall be arranged in proper order, indexed and suitably bound in a 3-ring loose-leaf binder for 8 1/2" X 11" paper with black vinyl covers. Label binder with embossed plastic tape designating the name of Project, Owner, Contractor, and equipment of materials included in the manual. Certify by endorsement therein that each of the manuals is complete and accurate. Deliver manuals to the Owner at the Final Inspection of the project.
- B. Submit three electronic copies of all manuals and documents in Adobe PDF format on CD or DVD-5, simultaneous with the Closeout Documents.

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- C. Special Requirements Mechanical (if applicable): Operating instructions for the principal plant mechanical components, for use by operating personnel, shall be provided. They shall be laminated between thermoplastic sheets and affixed where directed by the Architect or Owner. Instructions shall describe the function of the equipment, its most economical operation, start-up and shut-down procedures, procedures to follow in event of failure, normal maintenance practices, and caution and warning notices.
- D. Special Requirements Electrical (if applicable): Frame under glass, or clear plastic, one print of the "As-Built" power riser diagram at main switch or switchboard location or at a location directed by the Architect or Owner. Provide circuit identification for each circuit in each panel board cabinet.

## 1.08 GUARANTEES AND BONDS

A. Contractor shall submit to the Architect, simultaneous with the Closeout Documents, all warranties, guarantees, and Surety Bonds. All such documents shall show the name and location of the Project and the name of the Owner.

## 1.09 INSTRUCTIONS

A. Instruct Owner's personnel in required roof maintenance and operation of all systems, mechanical, electrical, and other equipment, prior to requesting the Punch List Inspection.

#### 1.10 ADVERTISEMENT OF COMPLETION

- A. Immediately after completion of the Contract, but not before receipt of a fully executed Final Completion Form, the General Contractor shall give notice of completion by an advertisement in the newspaper of general circulation published within the City or County wherein the work was done, once a week for four consecutive weeks.
- B. In no case will a final settlement be made upon the Contract until the expiration of thirty (30) days from commencement of advertisement or before receipt of advertisement with affidavit as required by law.
- C. Proof of publication of this Notice shall be submitted by the General Contractor, simultaneous with the Closeout Documents, by Affidavit of the publisher and a printed copy of the notice published. If no newspaper is published in the County, the notice must be posted at the Courthouse for thirty (30) days and proof shall be made by the Probate Judge or Sheriff and the Contractor.

#### 1.11 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

- A. Submit contractor's Affidavit of Payment of Debts and Claims: AIA G706, or approved equal.
- B. Submit Contractor's Affidavit of Release of Liens: AIA G706A, or approved equal, with:
  - 1. Consent of Surety to Final Payment: AIA G707, or approved equal.
  - 2. Contractor's Release or Waiver of LIENS.
- C. All submittals shall be duly executed before delivery to the Architect.

## 1.12 GENERAL CONTRACTORS GUARANTEE

A. The General Contractor shall submit in addition to any other expressed guarantees and/or warranties, a guarantee of all work under this Contract for a period of one year from date of final acceptance. Also, the General Contractor shall provide the State of Alabama Five-Year Roof Guarantee – if applicable.

### 1.13 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit final statement of accounting to the Architect. Statement shall reflect all adjustments, including, but not necessarily limited to, the following:
  - Original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Previous change orders.
    - b. Cash allowances.
    - c. Unit Prices.

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- d. Other adjustments.
- e. Deductions for uncorrected work.
- f. Penalties and bonuses.
- g. Deductions for liquidated damages.
- 3. Total Contract Sum, as adjusted.
- 4. Previous payments.
- 5. Sum remaining due.

## 1.14 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final application in accord with requirements of General and/or Supplementary Conditions, simultaneous with the Closeout Documents.

## 1.15 YEAR END INSPECTION

A. Sixty days prior to expiration of one year from date of "Final Acceptance" Contractor shall notify the Architect, in writing, of year-end inspection. Year-end inspection shall occur no more than forty-five and no less than fifteen days before the expiration of the Contractor's one-year warranty. The Architect will make visual inspection of project in company with Owner and Contractor to determine whether correction of work is required, in accordance with provisions of General Conditions. For guarantees beyond one year, Architect will make inspections at request of Owner, after notification to Contractor. The Architect will promptly notify Contractor, in writing, of any observed deficiencies.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**END OF SECTION** 

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# SECTION 01 78 13 PROJECT CLOSEOUT CHECKLIST

## **PART 1 - GENERAL:**

#### 1.01 SUMMARY

A. This Section consists of a shortform checklist for required closeout documents / submittals.

## 1.02 RELATED SECTIONS

A. Section 01 77 00 - Project Closeout

## 1.03 REQUIREMENTS

- A. See Section 01 77 00 for the full requirements of each of the following:
  - 1. Fully executed copy of the Certificate of Final Completion with copy of original punchlist
  - 2. Original Affidavit of "Advertisement of Completion" a copy of the ad must be attached to the affidavit form. (Not required if original awarded contract is less than \$50,000.00)
  - 3. General Contractor's Affidavit of Release of Liens
  - 4. General Contractor's Affidavit of Payment of Debts and Claims AIA G706A or approved equal
  - 5. Consent of Surety to Final Payment AIA G707 or approved equal (Not required if original awarded contract is less than \$50,000.00)
  - 6. General Contractors "One Year Guarantee"
  - 7. General Contractor's "State of Alabama Roof Guarantee" if applicable
  - 8. Other warranties as required by contract
  - 9. As-Built Drawings Changes should be legible, in permanent ink, and supplemented by detailed sketches or drawings when necessary
  - 10. Operating and Maintenance Manuals / Submittal / Product Literature & Technical Data

#### 1.04 SUBMITTALS

- A. Closeouts shall be submitted to the Architect in the following packages:
  - 1. Package #1 Final Pay Application Package contains at least two (2) original pay applications with items #1 #5 attached with binder clip or stapled not in three ring binder or paper clipped.
  - 2. Package #2 Warranty Package contains items #6 #8 attached with binder clip or stapled not in three ring binder or paper clipped.
  - 3. Package #3 Copy Package contains copies of items #1 #8 attached with binder clip or stapled not in three ring binder or paper clipped.
  - 4. Package #4 Compact Disc Package contains scans of items #1 #10 in PDF format on a single CD, three CDs total, with each item saved by number from 1.03.A (above).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

# SECTION 01 78 39 PROJECT RECORD DOCUMENTS

## **PART 1 - GENERAL**

## 1.01 SUMMARY

- A. This section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings (As-Builts)
  - 2. Record Product Data
- B. Related Sections:
  - 1. Section 01 77 00 Project Closeout

#### 1.02 SUBMITTALS

#### 1.03 RECORD DRAWINGS: COMPLY WITH THE FOLLOWING:

- A. Record Drawings number of copies:
- B. Punch-list Inspection: Submit one marked-up (red-lined) Record Drawings to the Architect and Owner's Representative at the start of the Punch-list Inspection for review. Any noted deficiencies are to be corrected prior to the Final Inspection.
- C. Final Inspection: Submit three marked-up (red-lined) Record Drawings and three electronic CD copies containing all drawings in PDF format to the Owner at the start of the Final Inspection. Failure to provide the Record Prints (hard copy and/or CD), in the required quantities at the start of the Final Inspection, may result in the Owner immediately terminating the Final Inspection.
- D. Record Project Data number of copies:
- E. Punch-list Inspection: Submit one set of Record Product Data for each item to the Architect and Owner's Representative at the start of the Punch-list Inspection for review. Any noted deficiencies are to be corrected prior to the Final Inspection.
- F. Final Inspection: Submit three sets of corrected, bound Record Product Data and three electronic CD copies containing all Record Product Data in PDF format to the Owner at the start of the Final Inspection. Failure to provide the Record Product Data (hard copy and/or CD), in the required quantities at the start of the Final Inspection, may result in the Owner immediately terminating the Final Inspection.

## **PART 2 - PRODUCTS**

#### 2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings at Project Site.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    - d. Content: Types of items requiring marking include, but are not limited to, the following:
      - 1) Dimensional changes to Drawings
      - 2) Revisions to details shown on Drawings
      - 3) Depths of foundations below first floor
      - 4) Locations and depths of underground utilities
      - 5) Revisions to routing of piping and conduits

- 6) Revisions to electrical circuitry
- 7) Actual equipment locations
- 8) Duct size and routing
- 9) Locations of concealed internal utilities
- 10) Changes made by Change Order or Construction Change Directive
- 11) Changes made following Contract Modifications
- 12) Details not on the original Contract Drawings
- 13) Field records for variable and concealed conditions
- 14) Record information on the Work that is shown only schematically
- 15) Changes made by Addenda
- 16) Changes/Clarifications made by Contract Directive
- 17) Changes made by approved Shop Drawings
- e. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings and physically append the Shop Drawings to final Record Drawings.
- f. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
- g. Mark important additional information that was either shown schematically or omitted from original Drawings.
- h. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, Addendum number(s), and similar identification, where applicable.
- B. Record Drawings: When authorized, prepare a full sets of drawings of the corrected Contract Drawings, and record copy of all Shop Drawings.
  - 1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw and add details and notation where applicable.
  - 2. Refer instances of uncertainty to Architect for resolution.
  - 3. Architect will furnish Contractor one set of Contract Drawings in electronic format, or .pdf files, for use in recording information.
  - 4. Print the Contract Drawings and Shop Drawings for use as Record Drawings.
- C. Format: Identify and date Record Drawing; include the designation "PROJECT RECORD DRAWING (AS-BUILTS)" in prominent location on the cover sheet.
  - 1. Record Drawings: Organize into bound sets. Place Drawings in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
  - 2. Identification: As follows:
    - a. Project name
    - b. Date
    - c. Designation "PROJECT RECORD DRAWINGS (AS-BUILTS)"
    - d. Name of Architect
    - e. Name of Contractor

#### 2.02 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## **PART 3 - EXECUTION**

# 3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of the project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner's and Architect's reference during normal working hours.

			Maintenan	ice Materials (Attic	Maintenance Materials (Attic Stock)/Replacement Stock List	: Stock List	
Material Name	% Materials	Manufacturer	Mfr. Number	Description	Product Type (mech, elect, HVAC, plumbing, controls, etc.)	Est. Current Cost	Date of Entry
Interior Items							
Ceiling Tiles	2%						
Window coverings	2%						
Ceramic Wall Tiles - field tiles	3%						
Ceramic Wall Tiles - specialty tiles	10%						
Paint	5% - not less than 1 gallon						
Flooring							
Carpet Tiles	2%						
Resilient Base	10 LF per 500 LF						
Resilient Flooring -Tiles	1 Box per 50 Boxes						
Hard Tile	3%						
Grout	2%						
Electrical							
Lamps (each type)	%5						
Exterior Items							
Paint	5% - not less than 1 gallon						
Brick/Split Face CMU	3%						
Wall pack lamps	5% - not less than 1						

# SECTION 01 79 00 DEMONSTRATION AND TRAINING

## **PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Section Includes: Administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training video recordings.
- B. Related Requirements:
  - 1. Divisions 01 through 33 Sections: Specific requirements for demonstration and training for products in those Sections.

## 1.02 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. This schedule must be submitted to the Architect AT LEAST 14 DAYS IN ADVANCE of the proposed training dates if multiple dates are proposed, then the schedule must be submitted at least 14 days in advance of the earliest date on the schedule. Submission of the schedule after with less than fourteen days before the first date shall be sufficient grounds, by itself, for the Owner to reject the schedule, or any portion of the schedule. If the schedule is rejected by the Owner, then it will be rescheduled at no additional expense to the Owner or Architect. ALL OPERATOR TRAINING MUST TAKE PLACE, AND RECORDINGS (1.03 A.) MUST BE PROVIDED TO ARCHITECT, PRIOR TO THE PUNCH LIST INSPECTION. Failure to conduct and provide recordings prior to the Punch List Inspection will be grounds for cancellation of the Punch List Inspection.
  - Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For facilitator, instructor, and videographer.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

## 1.03 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date of video recording.
  - 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 Final Inspection, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

#### 1.04 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 01 40 00 Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Pre-instruction Conference: Conduct conference at Project site. 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.

## 1.05 COORDINATION

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

## **PART 2 - PRODUCTS**

#### 2.01 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:
  - Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.

- f. Warranties and bonds.
- g. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - I. 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.
  - Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## **PART 3 - EXECUTION**

## 3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual.
- B. Set up instructional equipment at instruction location.

#### 3.02 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. 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 Architect with at least fourteen (14) 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 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.

#### 3.03 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.
  - At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
  - Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
  - 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 upon 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 DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. E-mail 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. Pre-produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

# SECTION 02 41 13 SELECTIVE SITE DEMOLITION

#### **PART 1 GENERAL**

## 1.01 SCOPE OF WORK

- A. Demolition shall, unless otherwise noted on Drawings, include removal of existing objects or improvements, whether indicated on drawings or not, that would in any way prevent or interfere with progress or completion of proposed work.
- B. Permits, fees, and licenses, if any, shall be secured and paid for by Contractor, including disposal charges as required to ensure progress of work will proceed.
- C. Work shall comply with the requirements of all governing authorities or utility owners in demolition of existing pavement, curbs and gutters, drainage structures, and utilities as may be required.

## 1.02 JOB CONDITIONS

#### A. Protections:

 Ensure safe passage of persons around areas of demolition. Conduct operations to prevent damage to adjacent buildings, structures, other facilities, and injury to persons.

## B. B. Damages:

 Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

## C. C. Utility Services:

- 1. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
- Do not interrupt existing utilities serving occupied facilities, except when authorized in writing by Owner. Provide temporary services during interruptions to existing utilities as acceptable to Owner.
- 3. Before starting work on sites, make arrangements for disconnection, rerouting, abandoning, or similar action as may be required relative to utilities and other underground piping, to permit work to proceed without delay. Arrangements shall be made in accordance with regulations of authorities of utilities concerned, including but not restricting any other services not mentioned, such as overhead and underground power, communication and telephone lines, equipment, gas piping, storm sewers, sanitary sewers, and water piping.
- 4. Contractor is to exercise care around and over any existing utility and the utility must remain in service until relocated and reconnected. All service lines and existing utilities are to be removed or relocated where present locations interfere with construction.
- 5. Contractor shall contact utility owners and obtain information as to location and condition of existing utilities and service lines.
- All utilities shown are based upon information available. Contractor shall verify location
  of those shown and determine if others are present before land disturbing operations
  are commenced. Contractor is responsible for any damage to existing utilities whether
  shown or not shown.

# PART 2 PRODUCTS (NOT USED)

## **PART 3 EXECUTION**

# 3.01 DEMOLITION

## A. Pollution Controls

- 1. Use water sprinkling and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
- 2. Do not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

#### B. Below Grade Construction:

1. Demolish and remove from sites below grade construction, concrete or asphalt slabs on grade or foundations if any.

## C. Filling Voids:

- Completely fill and compact below grade areas and voids resulting from demolition of improvements.
- 2. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots, and other organic matter.
- 3. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash, and debris.
- 4. Place fill materials in horizontal layers not exceeding 8" in loose depth.
- 5. Compact each layer at optimum moisture content of fill material to density equal to original adjacent ground, unless subsequent excavation for new work is required.
- 6. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.
- D. Provide temporary drainage as required to keep site in a dry condition. Keep top soil stripping to an absolute minimum. Dewater low areas prior to clearing, grubbing and stripping topsoil.
- E. Scaffolding, Barricades, Shoring, etc.
  - Scaffolding, barricades, shoring, etc. as required shall be provided by the Contractor in compliance with all recognized safety rules and prevailing laws, codes or ordinances applicable thereto. All such scaffolding, barricades, shoring, etc., shall remain until construction has been completed. The Contractor, upon completion, shall remove any and all scaffolding, barricades, shoring, etc; and leave site clean from debris and make ready for other construction.

#### F. Protection

- Existing walks, gates, drives, other improvements on or near the site that are to remain, shall be properly protected from damage of any kind by the contractor during the entire construction operation. Improvements that are damaged shall be replaced to the satisfaction of the Owner at Contractor's expense.
- 2. Provide all required fences, barricades, lights, walkways and other protection as may be required by the Owner for protection of the public on or near the site.

## 3.02 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from construction site debris, rubbish, and other materials resulting from demolition operations.
- B. No burning of any material, debris, or trash on site or off site will be allowed.
- C. Removal: Transport materials removed from demolished improvements and dispose of off site in a legal manner at an approved dump/waste facility.

# SECTION 02 41 16 SELECTIVE BUILDING DEMOLITION

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 Summary of Work: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 Temporary Facilities and Controls: Temporary construction, equipment, and protection.

## 1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2009.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Site Plan: Showing:
  - 1. Areas for temporary field offices and sheds.
- C. Demolition Plan: Submit demolition plan to Owner.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
  - 2. Include a summary of safety procedures, including Installation requirements.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

## **3.01 SCOPE**

- A. As indicated in Contract Drawings.
- B. Remove other items indicated, for salvage, relocation, recycling, or reuse.

## 3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. 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.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks.
  - 6. Conduct operations to minimize obstruction of entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Protect existing structures and other elements that are not to be 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.
- E. 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.
- F. If hazardous materials are discovered during removal operations, stop work and notify Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

## 3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; 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.

#### 3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as shown.
  - 2. Report discrepancies to Owner 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. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove items indicated on drawings.
- C. 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 that are to remain in operation; 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. Verify that abandoned services serve only abandoned facilities before removal.
  - 4. Remove abandoned pipe, ducts, conduits, and equipment. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- D. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
  - 4. Patch as specified for patching new work.

## 3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site and disposal in a legal manner.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

# SECTION 03 01 00 MAINTENANCE OF CONCRETE

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Cleaning of existing concrete surfaces at locations indicated.

#### 1.02 RELATED REQUIREMENTS

- A. Section 04 01 00 Maintenance of Masonry.
- B. Section 03 30 00 Cast-in-Place Concrete: Densification of existing concrete surfaces following cleaning.
- C. Section 09 91 23 Interior Painting: Striping of concrete floors following cleaning and densification, where indicated.

## 1.03 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- C. Manufacturer's Qualification Statement.
- D. Installer's Qualification Statement.

## 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 of 3 years of documented experience.

## 1.05 MOCK-UP(S)

- A. Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.
- B. Locate mock-up(s) where directed.
- C. Re-work mock-up(s) until satisfactory to Owner.
- D. Satisfactory mock-up(s) may remain as part of the work.

## 1.06 DELIVERY, STORAGE, AND HANDLING

 Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

## **PART 2 PRODUCTS**

## 2.01 CLEANING MATERIALS

- A. Degreaser:
  - 1. Manufacturers:
    - a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com.
    - L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com.
    - c. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com.
    - d. Substitutions: See Section 01 60 00 Product Requirements.

#### **PART 3 EXECUTION**

## 3.01 EXAMINATION

- Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

#### 3.02 CLEANING EXISTING CONCRETE

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces of grease, dirt or other contamination using the gentlest method that is effective.
  - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
  - 2. Clean out cracks and voids using same methods.
- C. Apply degreaser in accordance with manufacturer's recommendations.
- D. Scrub contaminated areas using brushes with natural or synthetic bristles.
- E. Flush with water or vacuum loosened contaminants, dirt, oi., and grease after scrubbing.
- F. Repeat as necessary at heavily contaminated areas.
- G. Do not use any of the following cleaning methods, unless otherwise indicated:
  - 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
  - 2. Acidic cleaning agents.
  - 3. Abrasive blasting.

# SECTION 03 10 00 CONCRETE FORMING AND ACCESSORIES

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

## 1.02 RELATED REQUIREMENTS

- A. Section 03 20 00 Concrete Reinforcing.
- B. Section 03 30 00 Cast-in-Place Concrete.
- Section 32 13 13 Concrete Paving: Concrete vehicular traffic pavements, walks and flumes.

#### 1.03 REFERENCE STANDARDS

- A. ACI 117 Specification for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 301 Specifications for Concrete Construction 2020.
- C. ACI 318 Building Code Requirements for Structural Concrete 2019, with Errata (2021).
- D. ACI 347R Guide to Formwork for Concrete 2014 (Reapproved 2021).

#### **PART 2 PRODUCTS**

#### 2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Chamfer outside corners of beams, joists, columns, and walls.
- Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

## 2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor, selected to provide continuous, straight, smooth exposed surfaces. Furnish the larges practical sizes to Minimize number of joints and to conform to joint system shown on the drawings.

## 2.03 REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gauge, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Pan Type: Steel, of size and profile indicated.

#### 2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length,cone type,with waterproofing washer, 1-1/2 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.

- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
  - 1. Composition: Colorless, reactive, water-based compound.
  - 2. Do not use materials containing diesel oil or petroleum-based compounds.
  - 3. VOC Content: In compliance with applicable local, State, and federal regulations.
  - Products:
    - a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com.
    - b. W. R. Meadows, Inc; Duogard II (water-based): www.wrmeadows.com.
    - c. Substitutions: See Section 01 60 00 Product Requirements.
- C. Dowels and Dowel Expansion Caps: See Section 03 30 00 Cast-in-Place Concrete.
- D. Filler Strips for Chamfered Corners: Rigid plastic type; 3/4 x 3/4 inch size; maximum possible lengths.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- F. Embedded Anchor Shapes, Plates, Angles and Bars: As required for work by others.

# **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

## 3.02 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

#### 3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on drawings.
- F. Provide chamfer strips on external corners of beams, joists and columns.
- G. Coordinate this section with other sections of work that require attachment of components to formwork.
- H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.
- I. Use new forms on exposed concrete surfaces.

## 3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

## 3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

#### 3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
  - 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
  - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

## 3.07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. Camber slabs and beams in accordance with ACI 301.

#### 3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control inspections and tests, as specified in Section 01 40 00 Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

## 3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

## SECTION 03 20 00 CONCRETE REINFORCING

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Reinforcing steel for reinforced unit masonry assemblies.
- C. Supports and accessories for steel reinforcement.

## 1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 Concrete Forming and Accessories.
- B. Section 03 30 00 Cast-in-Place Concrete.
- Section 32 13 13 Concrete Paving: Concrete vehicular traffic pavements, walks and flumes.

#### 1.03 REFERENCE STANDARDS

- A. ACI 301 Specifications for Concrete Construction 2020.
- B. ACI SP-66 ACI Detailing Manual 2004.
- C. ASTM A184/A184M Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement 2019.
- D. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- E. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- F. CRSI (P1) Placing Reinforcing Bars 2011.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
  - Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

## 1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI SP-66.

### **PART 2 PRODUCTS**

## 2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  - 1. Deformed billet-steel bars.
  - 2. Unfinished.
- B. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- C. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type; ASTM A1064/A1064M.
  - 1. Form: Flat Sheets.
  - 2. WWR Style: As indicated on drawings.
- D. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel or galvanized components for placement within 1-1/2 inches of weathering surfaces.

# 2.02 RE-BAR SPLICING

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
  - Products:
    - a. Dayton Superior Corporation; Bar Lock Coupler System: www.daytonsuperior.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.
- B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
  - Products:
    - Dayton Superior Corporation; Dowel Bar Splicer D101A with Straight Dowel-In: www.daytonsuperior.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.

## 2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI SP-66 ACI Detailing Manual and ACI SP-66 ACI Detailing Manual.
- B. Welding of reinforcement is not permitted.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

## **PART 3 EXECUTION**

## 3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as follows:
  - 1. Footings and Grade Beams: 3 inches clear bottoms and sides: 1-1/2 inches clear top.
  - 2. Concrete Slabs: 3/4 inch clear.
  - 3. Concrete Piers and Walls: 1-1/2 inches clear sides.
- E. Comply with applicable code for concrete cover over reinforcement.
- F. Bond and ground all reinforcement to requirements of Division 26.

## 3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, shall inspect installed reinforcement for compliance with contract documents before concrete placement.

## SECTION 03 30 00 CAST-IN-PLACE CONCRETE

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Underslab vapor barrier.
- C. Joint devices associated with concrete work.
- D. Miscellaneous concrete elements, including equipment pads.
- E. Concrete curing.
- F. Concrete densification.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 Quality Requirements: Procedures for testing and certifications.
- B. Section 01 73 29 Cutting and Patching.
- C. Section 03 01 00 Maintenance of Concrete: Cleaning of existing concrete surfaces.
- D. Section 03 10 00 Concrete Forming and Accessories: Forms and accessories for formwork; waterstops.
- E. Section 03 20 00 Concrete Reinforcing.
- F. Section 07 92 00 Joint Sealants: Products and installation for sealants and joint fillers for expansion joints, saw cut joints and isolation joints in slabs.
- G. Section 31 20 00 Earthwork: Subgrade preparation for footings, slabs and pavements; porous fill beneath concrete underslab vapor barriers and pavements.
- H. Section 32 13 13 Concrete Paving: Concrete vehicular traffic pavements, walks and flumes; densification of exterior concrete pavement surfaces.

## 1.03 REFERENCE STANDARDS

- A. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).
- B. ACI 301 Specifications for Concrete Construction 2020.
- C. ACI 302.1R Guide to Concrete Floor and Slab Construction 2015.
- D. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- E. ACI 305R Guide to Hot Weather Concreting 2020.
- F. ACI 306R Guide to Cold Weather Concreting 2016.
- G. ACI 308R Guide to External Curing of Concrete 2016.
- H. ACI 318 Building Code Requirements for Structural Concrete 2019, with Errata (2021).
- ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- J. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2010.
- K. ASTM C33/C33M Standard Specification for Concrete Aggregates 2018.
- L. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- M. ASTM C42/C42M Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete; 2012.
- N. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete 2022.

- O. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.
- P. ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- Q. ASTM C150/C150M Standard Specification for Portland Cement 2021.
- R. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete 2020.
- ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete; 2010.
- T. ASTM C173/C173M Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- U. ASTM C231/C231M Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2010.
- V. ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- W. ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete 2019.
- X. ASTM C579 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes 2018.
- Y. ASTM C881/C881M Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2020a.
- ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2021.
- AA. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2020.
- BB. ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.
- CC. ASTM D8139 Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction 2017.
- DD. ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.
- EE. ASTM E1155M Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric) 2014.
- FF. ASTM E1643 Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.
- GG. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs 2017.

## 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.
  - Indicate proposed mix design complies with requirements of ACI 301, Section 4 -Concrete Mixtures.
  - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 Concrete Quality, Mixing and Placing.
  - 3. Include the following information:
    - a. Proportions of cement, fine and coarse aggregate, and water.
    - b. Water/cement ratio, design strength, slump, and air content.
    - c. Type of cement and aggregates.
    - d. Type and dosage of all admixtures.
    - e. Special requirements for pumping.

- f. Any special characteristics of the mix which require precautions in the mixing, placing, or finishing techniques to achieve the finished product specified.
- D. Samples: Submit two, 12 inch long samples of construction joint devices.
- E. Testing Laboratory Reports: Submit report for each test or series of tests specified in writing to Owner, Architect, Structural Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain:
  - 1. Project identification name and number.
  - 2. Date of concrete placement.
  - 3. Name of concrete testing service.
  - 4. Concrete type and class.
  - 5. Location of concrete placed in structure.
  - 6. Design compressive strength at 28 days.
  - 7. Concrete mix proportions and materials.
  - 8. Compressive breaking strength.
  - 9. Type of break for both 7-day and 28-day tests.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

## 1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

#### **PART 2 PRODUCTS**

## 2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

## 2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

## 2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I Normal or Type II Moderate Portland type.
  - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
  - 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

### 2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.

- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

## 2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
  - Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
  - 2. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor barrier.
  - 3. Manufacturers:
    - a. Fortifiber Building Systems Group ; Moistop Ultra 15 Underslab Vapor Retarder: www.fortifiber.com.
    - b. Stego Industries, LLC; Stego Wrap Vapor Barrier 15-mil (Class A): www.stegoindustries.com.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
  - 1. Grout: Comply with ASTM C1107/C1107M.
  - 2. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
  - 3. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
  - 4. Flowable Products:
    - a. Dayton Superior Corporation; Sure-Grip High Performance Grout: www.daytonsuperior.com.
    - b. Euclid Chemical Company; NS GROUT: www.euclidchemical.com.
    - L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc;
       DURAGROUT: www.laticrete.com/our-products/concrete-construction-chemicals.
    - d. SpecChem, LLC; SC Precision Grout: www.specchemllc.com.
    - e. W. R. Meadows, Inc; 588-10K: www.wrmeadows.com.
  - 5. Low-Slump, Dry Pack Products:
    - a. Dayton Superior Corporation; Dri Pak Precast Grout: www.daytonsuperior.com.
    - b. Euclid Chemical Company; DRY PACK GROUT: www.euclidchemical.com.
    - c. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: www.lmcc.com.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
  - Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch.
  - 2. Manufacturers:
    - a. Dayton Superior Corporation; Epoxy Grout J55: www.daytonsuperior.com.
    - b. Euclid Chemical Company; E3-DEEP POUR: www.euclidchemical.com/#sle.
    - c. SpecChem, LLC; SpecPoxy Grout: www.specchemllc.com.
    - d. W. R. Meadows, Inc; REZI-WELD 3/2: www.wrmeadows.com.

## 2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
  - 1. Manufacturers:
    - a. Dayton Superior Corporation; Acrylic Bonding Agent J40: www.daytonsuperior.com.
    - b. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com.
    - c. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com.
    - d. W.R. Meadows, Inc.; ACRY-LOK: www.wrmeadows.com.
- B. Epoxy Bonding System: Complying with ASTM C881/C881M and of Type required for specific application.

- Manufacturers:
  - a. Dayton Superior Corporation; Slow Set Bonding Agent: www.daytonsuperior.com.
  - Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com.
  - c. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000, or SpecPoxy 3000FS: www.specchemllc.com.
  - d. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000: www.wrmeadows.com.
- C. Preformed Expansion Joint Filler or Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
  - 1. Material: ASTM D8139, semi-rigid, closed-cell polypropylene foam.
  - 2. Manufacturers:
    - Nomaco, Inc; Nomaflex Expansion Joint Filler with Void Cap Option: www.nomaco.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.
- D. Joint Sealants: As specified in Section 07 92 00.
- E. Smooth Round Dowels: ASTM A615 Grade 60 steel.
  - 1. Size: 5/8 inch diameter x 18 inches long.
- F. Dowel Expansion Caps: Welded type metal dowel cap; I.D. sized 1/8 inch larger than nominal diameter of dowel.
  - 1. Product: Dayton Superior; Dowel Cap K11-Welded Type: www.daytonsuperior.com; or approved equivalent.
  - 2. For use at expansion joints where dowels are indicated.
- G. Dowel Sleeves: High density polypropylene sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
  - 1. Size: 3/4 inch x 9 inches.
  - 2. Product: BoMetals, Inc; QuicDowel: www.bometals.com; or approved equivalent.
    - a. Provide 3/4 inch nailable plastic base with each dowel sleeve.
    - b. For use at construction joints where dowels are indicated.
    - c. Substitutions: See Section 01 60 00 Product Requirements.

#### 2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
  - 1. Manufacturers:
    - a. Dayton Superior Corporation; AquaFilm Concentrate J74RTU: www.daytonsuperior.com.
    - b. Euclid Chemical Company; EUCOBAR: www.euclidchemical.com.
    - c. Sika Corp; SikaFilm: www.sika.com.
    - d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com.
    - e. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com.
- B. Concrete Curing Compound: All resin, dissipating, water-based concrete curing compound.
  - 1. Product: Dayton Superior "Clear Cure VOC J7WB": www.daytonsuperior.com; or approved equivalent.
    - a. Compliance: ASTM C309, Type 1, Classed A and B.
    - b. Moisture Loss: Meets ASTM C309. Less than 0.55 kg per sq. m.
    - c. Dry Time: Approximately 2 hours at 70 degrees F.
    - d. VOC Content: <100 g/L.
- C. Water: Potable, not detrimental to concrete.

#### 2.08 CONCRETE DENSIFICATION MATERIALS

- A. Liquid Densifier: Water-based, odorless solution of lithium silicates, designed to react with materials present in new or old concrete in order to densify, harden, and dustproof the surface of the slab.
  - 1. Interior Use Product: Dayton Superior "Pentra-Hard Densifier": www.daytonsuperior.com; or approved equivalent.
    - a. Specific Gravity: 1.05.
    - b. Flash Point: None.
    - c. pH: 11.
    - d. One component; no diluting required.
    - e. Actual VOC = 50 g/L.
    - f. Approved Equivalent Products:
      - 1) Euclid Chemical Company; ULTRASIL LI+: www.euclidchemical.com.
      - L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; LiON HARD: www.lmcc.com.
      - 3) W. R. Meadows, Inc; Liqui-Hard Ultra: www.wrmeadows.com.
  - 2. Exterior Use Product: Dayton Superior "Pentra-Hard EDH Exterior Densifier": www.daytonsuperior.com; or approved equivalent.
    - a. Specific Gravity: 1.06.
    - b. Flash Point: None.
    - c. pH: 11.5.
    - d. One component; no diluting required.
    - e. Actual VOC less than 50 g/L.
  - 3. Properties of Densified Concrete:
    - a. Abrasion Resistance, Improvement over Untreated: + 50%, per ASTM C501.
    - b. Coefficient of Friction Compared to Untreated Concrete: No change.

# 2.09 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
  - 1. For trial mixtures method, employ independent testing agency acceptable to Owner for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
  - Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.
  - 2. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
  - 3. Use air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having the total air content as shown on the drawings.
  - 4. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- D. Normal Weight Concrete:
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days:
    - a. For Use in Slabs, Footings and Grade Beams: 4000 psi.
  - 2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
  - 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
  - 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
  - 5. Combined Fly Ash/Calcined Pozzolan/Silica Fume Content: Maximum 20 percent of cementitious materials by weight.
  - 6. Water-Cement Ratio:
    - a. For 4000 PSI Concrete: Maximum 45 percent by weight.

- 7. Total Air Content: 2 4 percent typical, except 5 percent for concrete exposed to freeze-thaw cycles; determined in accordance with ASTM C173/C173M.
- 8. Maximum Slump: 5 inches.

#### **2.10 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.
  - Addition of water to batch for material with insufficient slump will be permitted in accordance with ACI 301, except no water shall be added on site without approval of the Testing Lab Representative on site.
  - 2. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

#### PART 3 EXECUTION

#### 3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

# 3.02 PREPARATION

- A. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
  - 1. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.
- B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
  - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
  - 2. Use latex bonding agent only for non-load-bearing applications.
- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- D. Interior Slabs on Grade: Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor barrier before covering.
  - 1. Vapor Barrier Over Crushed Stone Base: Vapor barrier shall be installed over 6" thick layer of crushed stone base (ALDOT 825) compacted to 100% modified density, as specified in Section 31 20 00 Earthwork.

# 3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect and Owner not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

# 3.04 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Expansion Joints: Install load transfer devices and full-depth joint filler as indicated. Install smooth round dowels of diameter, length, and spacing as indicated. On one end of each dowel, provide dowel expansion cap and thoroughly grease the sliding portion of the dowel. Dowels must be accurately aligned and must remain in place during concrete placement and curing. Apply joint sealer to top of expansion joint.
- D. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
  - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- E. Construction Joints: Install load transfer devices as indicated. Use dowel sleeves and smooth round dowels of diameter, length, and spacing as indicated. Tool top edges of joints to allow placement of backer rod and sealant.
- F. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 2 inches deep but not less than one third (1/3) the depth of the slab.
- G. Seal all expansion, isolation, construction, and saw cut contraction joints with joint sealer as specified in Section 07 92 00.

# 3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
  - 1. Concrete Floors: F(F) of 35; F(L) of 25, on-grade only.
- C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 23 / F(L) 16.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

# 3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
  - Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
  - 1. Interior Concrete Floors: "Steel trowel" as described in ACI 302.1R.
  - 2. Exterior Concrete Pads: Light broom finish, with troweled and radiused edge 1/4 inch radius.
- E. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects, followed by a light broom finish.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

# 3.07 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
  - 1. Evaporation Reducer: Apply in accordance with manufacturer's instructions immediately after screeding and bull floating, but before power floating and troweling.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal Concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms: Place **curing compound** on exposed concrete surfaces immediately after finishing. Apply in two coats at right angles, using application rate recommended by manufacturer.
  - 1. Curing Compound, General: Follow all manufacturer's recommendations and written instructions when applying curing compound.
  - 2. Procedure:
    - a. Mixing: Stir curing compound thoroughly prior to use. Do not thin.
    - b. Apply curing compound immediately after all surface (bleed) water has disappeared and the surface cannot be marred.
      - 1) Do not delay in applying the curing compound.
    - c. Spray application is recommended. Small areas may be roller or brush applied.
    - d. Apply curing compound uniformly and at the recommended coverage rates.
    - e. Apply curing compound using spray equipment capable of atomizing the product into a fine spray mist.
      - 1) Use a fine spray tip and keep equipment under constant even pressure.
      - 2) Apply uniformly without puddling.
      - 3) For vertical applications, apply two light coats. Apply the second coat while the first coat is still wet.
        - (a) Apply even coats avoiding run-downs and streaks.
      - 4) Application Rate (steel troweled surfaces): 400 sq. ft. per gallon.
      - 5) Application Rate (broom-finished surfaces): 200 sq. ft. per gallon.
- E. Curing Compound Removal: Properly applied, the specified curing compound will normally begin to dissipate and wear off within 7 10 days after application. After this time, but **prior to application of concrete densifier**, curing compound shall be **totally removed** with one of the following methods:
  - 1. Water under pressure.
  - 2. Scrubbing equipment.
  - 3. Dayton Superior Citrus Cleaner J48, or approved equivalent.

#### 3.08 CONCRETE DENSIFICATION

- General: Follow all manufacturer's recommendations and written instructions when applying densifier.
  - Apply densifier to all new concrete pavements and other exposed concrete surfaces.
  - 2. Allow new concrete to cure a minimum of **28 days** prior to application of densifier.
  - 3. Thoroughly clean all surfaces to remove all dirt, debris, **curing compounds** and other materials that may inhibit the penetration of the densifier.
  - 4. Do not apply densifier to a wet surface.
- B. Mixing: Thoroughly mix materials prior to each use. Do not thin or dilute.
- C. Densifier Application:

- 1. Apply densifier material using HVLP (high volume low pressure) sprayer, or hand pump-up sprayer or roller for small applications. Broom out any puddles with a soft bristle broom.
  - a. Application Rate (steel troweled surfaces): 400 500 sq. ft. per gallon.
  - b. Application Rate (broom-finished surfaces): 250 350 sq. ft. per gallon.
- 2. For best results, apply product to substrate saturation point.
- Keep the surface wet with product for at least 20 minutes, spraying on more material if necessary.
- 4. Only apply when temperatures will be over 40 degrees F for at least 4 hours following application.
- 5. The surface may be used when it is dry to the touch, but complete curing may take hours to days to complete, depending on conditions.

# 3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
  - 1. Slump: ASTM C143; one slump test at point of discharge for each set of test cylinders taken; additional tests when concrete consistency seems to have changed.
  - 2. Air Content: ASTM C231, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
  - Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, when 80 degrees F and above, and each time a set of compression test specimens is made.
  - Compression Test Specimens: ASTM C31; one set of 4 standard cylinders for each
    compressive strength test, unless otherwise indicated. Mold and store cylinders for
    laboratory-cured test specimens except when field-cure test specimens are required.
    - a. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Compressive Strength Tests: ASTM C39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed (slabs and walls). One specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. Any additional cylinders required by the Contractor for early strength gain tests for form stripping are the Contractor's responsibility and shall be paid for by Contractor.
  - 1. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  - 2. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

H. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Owner. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

# 3.10 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Owner. The cost of additional testing, repair and replacement shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner for each individual area.

## 3.11 PROTECTION

A. Do not permit traffic over unprotected concrete surfaces until fully cured.

**END OF SECTION** 

# SECTION 04 01 00 MAINTENANCE OF MASONRY

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

A. Chemical cleaning of masonry surfaces indicated.

#### 1.02 RELATED REQUIREMENTS

- A. Section 03 01 00 Maintenance of Concrete: Cleaning of concrete floors.
- B. Section 07 92 00 Joint Sealants: Re-sealing EJs and CJs in existing CMU walls.

#### 1.03 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on cleaning solutions.
- C. Manufacturer's Instructions: For cleaning materials, indicate special procedures, conditions requiring special attention.

#### 1.04 QUALITY ASSURANCE

A. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

#### 1.05 MOCK-UP

- A. Clean a 4 ft by 4 ft panel of wall to determine extent of cleaning.
  - 1. Repeat, using different cleaning methods until acceptable.
- B. Locate where directed.
- Acceptable panel and procedures employed will become the standard for work of this section.
- D. Mock-up may remain as part of the Work.

# **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. Restoration and Cleaning Chemicals:
  - 1. Diedrich Technologies, Inc: www.diedrichtechnologies.com.
  - 2. HMK Stone Care System: www.hmkstonecare.com.
  - PROSOCO: www.prosoco.com.

#### 2.02 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

# PART 3 EXECUTION

#### 3.01 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

#### 3.02 PREPARATION

- A. Protect surrounding elements from damage due to restoration procedures.
- B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
- C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
- D. Cover existing landscaping with tarpaulins or similar covers.
- E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.
- F. Close off adjacent occupied areas with dust proof and weatherproof partitions.

G. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

# 3.03 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at indicated locations with chemical type cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

# 3.04 CLEANING

- A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
- B. Clean surrounding surfaces.

**END OF SECTION** 

# SECTION 04 05 11 MASONRY MORTARING AND GROUTING

# **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 04 29 00 Engineered Unit Masonry: CMU construction.
- C. Section 09 90 00 Painting and Coating.

#### 1.03 REFERENCE STANDARDS

- A. TMS 402/602 Building Code Requirements and Specification for Masonry Structures 2016.
- B. ASTM C91/C91M Standard Specification for Masonry Cement 2018.
- C. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete 2022.
- D. ASTM C270 Standard Specification for Mortar for Unit Masonry 2019a, with Editorial Revision.
- E. ASTM C387/C387M Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar 2017.
- F. ASTM C476 Standard Specification for Grout for Masonry 2020.

#### 1.04 SUBMITTALS

- A. See Section 01 30 00 Submittals, for submittal procedures.
- B. Product Data: Submit manufacturer's data on manufactured products showing compliance with specified requirements. Also include required environmental conditions and admixture limitations.
- Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

# 1.05 QUALITY ASSURANCE

 Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

# 1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

# 1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

# **PART 2 PRODUCTS**

# 2.01 MORTAR AND GROUT APPLICATIONS

- A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.
- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Mortar Mix Designs: ASTM C270, Property Specification.
  - 1. Exterior, Loadbearing Masonry: Type S.
  - 2. Exterior, Non-loadbearing Masonry: Type S.
  - 3. Interior, Loadbearing Masonry: Type N.
  - 4. Interior, Non-loadbearing Masonry: Type N.

- D. Grout Mix Designs:
  - Masonry Cores, Masonry Cores, and Masonry Cores: 3,000 psi strength at 28 days;
     8-10 inches slump; mix in accordance with ASTM C476.
    - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
    - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
  - 2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
    - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
    - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

# 2.02 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed masonry cement and mason's sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
  - 1. Type: Types as scheduled in this section.
  - 2. Color: Standard gray.
  - Manufacturers:
    - a. Amerimix, an Oldcastle brand; AMX 500: www.amerimix.com.
    - b. The QUIKRETE Companies; QUIKRETE® Mason Mix: www.quikrete.com.
    - c. Spec Mix, Inc; Masonry Cement & Sand: www.specmix.com.
    - d. Substitutions: See Section 01 60 00 Product Requirements.
- B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
  - 1. Types: Fine and Coarse, as required.
  - 2. Manufacturers:
    - a. Amerimix, an Oldcastle brand; AMX 600: www.amerimix.com.
    - b. The QUIKRETE Companies; Core-Fill Grout: www.quikrete.com.
    - c. Spec Mix, Inc; Core Fill Grout: www.specmix.com.
    - d. Substitutions: See Section 01 60 00 Product Requirements.
- C. Water: Clean and potable.
- D. Bonding Agent: Latex type.

## 2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. If water is lost by evaporation, re-temper only within two hours of mixing.

## 2.04 GROUT MIXING

- A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- B. Do not use anti-freeze compounds to lower the freezing point of grout.

# PART 3 EXECUTION

# 3.01 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.
- B. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

# 3.02 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Work grout into masonry cores and cavities to eliminate voids.

- C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.
- D. Do not displace reinforcement while placing grout.
- E. Remove excess mortar from grout spaces.

#### 3.03 GROUTING

- A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.
- B. Low-Lift Grouting:
  - 1. Limit height of pours to 12 inches.
  - 2. Limit height of masonry to 16 inches above each pour.
  - 3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
  - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
  - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
  - 2. Hollow Masonry: Limit lifts to maximum 4 feet and pours to maximum height of 24 feet.
  - 3. Place grout for spanning elements in single, continuous pour.

# **END OF SECTION**

# SECTION 04 29 00 ENGINEERED UNIT MASONRY

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Concrete Block, in the following textures:
  - Smooth face.
- B. Reinforcement and anchorage.
- C. Accessories.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 02 41 16 Selective Building Demolition.
- C. Section 03 20 00 Concrete Reinforcing: Reinforcing steel for reinforced masonry construction.
- D. Section 04 05 11 Masonry Mortaring and Grouting.
- E. Section 09 91 13 Exterior Painting: Finishes for block walls.
- F. Section 09 91 23 Interior Painting.

#### 1.03 REFERENCE STANDARDS

- A. TMS 402/602 Building Code Requirements and Specification for Masonry Structures 2016.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A951/A951M Standard Specification for Steel Wire for Masonry Joint Reinforcement 2016, with Editorial Revision (2018).
- D. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- E. ASTM C55 Standard Specification for Concrete Building Brick 2017.
- F. TMS 402/602 Building Code Requirements and Specification for Masonry Structures 2016.

# 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

## 1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- 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 of documented experience.

# 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

# 1.07 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

# **PART 2 PRODUCTS**

# 2.01 CONCRETE MASONRY UNITS (CMU)

- A. Concrete Block: Lightweight concrete masonry units meeting the requirements of ASTM C90 and as follows:
  - 1. Maximum Unit Concrete Weight: 105 lbs per cubic foot oven dry.
  - 2. Minimum Net Area Compressive Strength:
    - a. 1900 psi (average of 3 units).
    - b. 1700 psi (individual units).
  - 3. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
  - 4. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
  - 5. Fire-Rated Concrete Block: Where required, provide CMU bearing the proper UL Classification for the wall assembly.
  - 6. Manufacturer: Block USA; Franklin Series Gray Concrete Masonry: www.specblockusa.com; or approved equivalent.
    - a. Texture: Provide smooth face units.
    - b. Color: Standard gray.
- B. Concrete Brick:
  - 1. Size: As indicated on drawings or as required.
  - 2. Concrete Building Brick: ASTM C55; lightweight, solid, for interior or concealed use.

#### 2.02 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 05 11.

# 2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
  - 1. Blok-Lok Limited: www.blok-lok.com.
  - 2. Hohmann & Barnard, Inc: www.h-b.com.
  - 3. Wire-Bond: www.wirebond.com.
- B. Reinforcing Steel: Type specified in Section 03 20 00; size as indicated on drawings; uncoated finish.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
  - 1. Type: Ladder.
  - Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
  - 3. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- D. Rebar Positioners:
  - Vertical: Wire-Bond "Core-Lock" Rebar Positioner, or approved equivalent.
    - Diagonally positioned, installed 1-1/4 inches deep into the CMU cell, not on top of the block
    - b. Fabricated of 9 gage, hot dip galvanized, cold drawn steel wire.
    - c. Size:
      - 1) For 8" CMU: #3410 8" Single.
      - 2) For 12" CMU: #3410 12" Single.
  - 2. Horizontal: Wire-Bond "Bond Beam Rebar Positioner," or approved equivalent.
    - a. Fabricated of 9 gage, hot dip galvanized, cold drawn steel wire.
    - b. Size: As required for 8" or 12" bond beams.

#### 2.04 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
  - Manufacturers:
    - a. Blok-Lok Limited: www.blok-lok.com.
    - b. Hohmann & Barnard, Inc: www.h-b.com
    - c. WIRE-BOND: www.wirebond.com.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
  - 1. Product: Equivalent to Hohmann & Barnard #NS Closed Cell Neoprene Sponge.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

#### 2.05 MORTAR MIXES

A. Mortar: As specified in Section 04 05 11.

# 2.06 GROUT MIXES

A. Grout: As specified in Section 04 05 11.

#### PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

#### 3.02 PREPARATION

- Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Clean reinforcement of loose rust.
- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- D. For areas where high-lift grouting will be employed, provide cleanout openings as follows:
  - 1. Hollow Masonry: Not less than 8 inches high at the bottom of each cell to be grouted, formed by cutting out face shell of masonry unit.

# 3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - Mortar Joints: Concave.

# 3.04 PLACING AND BONDING

- At fire-rated walls, lay CMU in accordance with requirements of UL Design Number indicated on drawings.
- B. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- Lay hollow masonry units with face shell bedding on head and bed joints.
- D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- E. Remove excess mortar as work progresses.

- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

#### 3.05 REINFORCEMENT AND ANCHORAGE

- A. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
  - 1. Welding of splices is not permitted.
  - Provide rebar positioners at maximum 48 inches on center vertically in reinforced CMU cells.
  - 3. Provide bond beam rebar positioners at maximum 48 inches on center horizontally in CMU bond beams and lintels.
- B. Joint Reinforcement: Install horizontal joint reinforcement 16 inches on center.
  - 1. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
  - 2. Place continuous joint reinforcement in first and second joint below top of walls.
  - 3. Lap joint reinforcement ends minimum 6 inches.
  - 4. Reinforce joint corners and intersections with prefabricated corners and tees 16 inches on center.
- C. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.
  - 1. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry units or saw to accommodate reinforcement.

#### 3.06 GROUTING

A. Grouting: As specified in Section 04 05 11.

# 3.07 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joints as detailed on drawings.

# 3.08 BUILT-IN WORK

- A. As work progresses, install built-in anchor bolts, plates, and beams and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Do not build into masonry construction organic materials that are subject to deterioration.

# 3.09 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

# 3.10 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

## 3.11 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

# 3.12 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

# **END OF SECTION**

# SECTION 05 40 00 COLD-FORMED METAL FRAMING

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

A. Formed steel stud interior wall framing (18 gage and heavier).

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 06 10 00 Rough Carpentry: Plywood wainscoting at Metal Storage Building.
- C. Section 09 21 16 Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing (20 gage and lighter); gypsum wallboard; acoustical insulation.

# 1.03 REFERENCE STANDARDS

- A. AISI S100 North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2018).
- B. AISI S200 North American Standard for Cold-Formed Steel Framing General Provisions 2012.
- C. ASTM A1003/A1003M Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- D. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- E. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- F. ASTM C1007 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.
- G. AWS D1.1/D1.1M Structural Welding Code Steel 2020, with Errata (2022).
- H. SSPC-Paint 20 Zinc-Rich Coating (Type I Inorganic, and Type II Organic) 2019.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

# 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
  - 1. Indicate stud layouts.
  - Design data:
    - a. Shop drawings signed and sealed by a professional structural engineer.
- E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.
- F. Designer's Qualification Statement.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.

#### 1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- D. Metal stud manufacturer shall be responsible for detailing all connections.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Metal Framing:
  - 1. CEMCO: www.cemcosteel.com.
  - 2. ClarkDietrich: www.clarkdietrich.com.
  - MarinoWARE: www.marinoware.com.
  - 4. The Steel Network, Inc: www.SteelNetwork.com.
  - 5. Super Stud Building Products, Inc: www.buysuperstud.com.
  - 6. Telling Industries: www.tellingindustries.com.
- B. Framing Connectors and Accessories:
  - 1. Same manufacturer as metal framing.
  - 2. Simpson Strong Tie: www.strongtie.com.

# 2.02 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
  - 1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
  - 2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
  - 3. Design Loads: As indicated on drawings.
  - 4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
  - Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- C. Shop fabricate framing system to the greatest extent possible.
- D. Deliver to project site in largest practical sections.

# 2.03 FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S200 and ASTM C955.
  - 1. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
    - a. Grade: ST50H (50 ksi yield strength).
    - b. Coating: ASTM A653/A653M: G90 (Z275) hot dip galvanized.
  - 2. Minimum Base-Metal Thicknesses:
    - a. 18 Gage: 43 mils, 0.0428 inch.
    - b. 16 Gage: 54 mils, 0.0538 inch.
    - c. 14 Gage: 68 mils, 0.0677 inch.
    - d. 12 Gage: 97 mils, 0.0966 inch.

- B. Steel Studs: Manufacturer's standard C-shaped steel studs, punched, with stiffened flanges.
  - 1. Gauge and Depth: As indicated on drawings.
    - a. Provide heavier gages than indicated when necessary to meet specified performance levels.
  - 2. Flange Width: 1-5/8 inches minimum.
  - 3. Steel Stud Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges.
    - a. Gage: Match steel studs.
    - b. Flange Width: 1-5/8 inches minimum.
- C. Framing Connectors: Factory-made, formed steel sheet.
  - 1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gauge, 0.1345 inch, and factory punched holes and slots.
  - 2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100.
  - 3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
    - a. Where continuous studs bypass structural supports, connect stud to support in manner allowing vertical movement of support without affecting studs; allow for minimum movement of 1/2 inch.
    - b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical movement of structure without affecting studs; allow for minimum movement of 1/2 inch.
    - Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 10 feet.
  - 4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
  - 5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings.
  - 6. Products: Equivalent to the following by Simpson Strong Tie: www.strongtie.com.
    - a. Load Rated Steel Stud Connectors: LSSC6.25.
    - b. Load Rated Steel Stud Framing Connectors: SFC6.25.
    - c. Load Rated Moment-Resisting Kneewall Connectors: MSSC6.25KW.
    - d. Load Rated Steel Joist and Kicker Connectors: SJC10.25.
    - e. Bridging Connectors: MSUBH3.25.
    - f. Fixed Connectors: FCB, size as required.
    - g. By-Pass Movement Connectors: SCB, size as required.
    - h. By-Pass Strut Movement Connectors: SSB 3.518 Bypass Framing Strut.
    - i. Head of Wall Movement Connectors: SCW 5.5 Head-Of-Wall Clip.
    - j. Substitutions: See Section 01 60 00 Product Requirements.

#### 2.04 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
  - 1. Products:
    - a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.
- B. Anchorage Devices: Powder actuated.
- C. Welding: Comply with AWS D1.1/D1.1M.

#### 2.05 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II Organic, complying with VOC limitations of authorities having jurisdiction.
  - 1. Provide "ZRC Cold Galvanizing Compound" manufactured by ZRC Worldwide: www.zrcworldwide.com; or approved equivalent.

#### PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Verify that building framing components are ready to receive work.
- B. Verify field measurements and adjust installation as required.

#### 3.02 INSTALLATION OF STUDS

- Install components in accordance with ASTM C1007 requirements and ASTM C1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches on center.
- C. Cut framing members by sawing or shearing; do not torch cut.
- D. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.
  - 1. Locate and install mechanical fasteners according to Shop Drawings, complying with requirements for spacing, edge distances, and screw penetrations.
- E. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- F. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
- G. Install load-bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- H. Install intermediate studs above and below openings to align with wall stud spacing.
- Provide deflection allowance in stud track, directly below horizontal building framing at nonload bearing framing.
- J. Attach cross studs to studs for attachment of fixtures anchored to walls.
- K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- L. Install horizontal bridging in stud walls at maximum spacing of 48 inches o.c.
- M. Touch-up field welds and damaged galvanized surfaces with primer.

# 3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/4 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

# **END OF SECTION**

# SECTION 05 50 00 METAL FABRICATIONS

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Shop fabricated steel items, including:
  - 1. Steel pipe bollards.
  - Door frames for overhead doors (as required).
  - 3. Miscellaneous loose steel angles, channels, plates, and lintels as required.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 05 40 00 Cold-Formed Metal Framing.
- C. Section 08 33 23 Overhead Coiling Doors.
- D. Section 09 91 13 Exterior Painting: Paint finish.
- E. Section 09 91 23 Interior Painting: Paint finish.
- F. Section 32 13 13 Concrete Paving.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- C. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- E. ASTM A283/A283M Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- F. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- G. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- H. ASTM A786/A786M Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates 2015 (Reapproved 2021).
- ASTM F3125/F3125M Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.
- J. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- K. AWS D1.1/D1.1M Structural Welding Code Steel 2020, with Errata (2022).
- L. SSPC-Paint 20 Zinc-Rich Coating (Type I Inorganic, and Type II Organic) 2019.

# 1.04 SUBMITTALS

- A. See Section 01 33 00 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.

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## **PART 2 PRODUCTS**

# 2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.
- E. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.
- F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II Organic, complying with VOC limitations of authorities having jurisdiction.
  - 1. Provide "ZRC Cold Galvanizing Compound" manufactured by ZRC Worldwide: www.zrcworldwide.com; or approved equivalent.

#### 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. Continuously seal joined members by continuous welds.
- D. 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.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. 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

- Bollards: Steel pipe, 6-inch diameter, Schedule 40, concrete filled, crowned cap; hot-dip galvanized.
  - 1. Design information is on the drawings.
  - 2. Finish:
    - a. Exterior Bollards: Field painted, yellow.
- B. Door Frames for Overhead Door Openings and Wall Openings: Channel, Angle, and Tube sections as detailed; galvanized finish. Coordinate fabrication with respective section of work.

# 2.04 FINISHES - STEEL

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 2.0 oz/sq ft galvanized coating.

# 2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

05 50 00 - 2 METAL FABRICATIONS

# PART 3 EXECUTION

# 3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

# 3.02 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. Mechanically cut galvanized surfaces. Do not flame cut.
- D. Field weld components as indicated on shop drawings.
- E. Perform field welding in accordance with AWS D1.1/D1.1M.
- F. Obtain approval prior to site cutting or making adjustments not scheduled.
- G. After erection, touch-up galvanized surfaces as required with galvanizing repair compound.

# 3.03 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** 

METAL FABRICATIONS 05 50 00 - 3

# SECTION 06 10 00 ROUGH CARPENTRY

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Preservative treated (PT) wood materials.
- B. Fire-retardant treated wood (FRTW) materials.
- C. Miscellaneous framing and sheathing.
- D. Communications and electrical mounting boards.
- E. Concealed wood blocking, nailers, and supports.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 05 40 00 Cold Formed Metal Framing.
- C. Section 06 41 00 Architectural Wood Casework.
- D. Section 09 21 16 Gypsum Board Assemblies: Non-loadbearing framing.
- E. Section 09 91 23 Interior Painting.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C. AWPA U1 Use Category System: User Specification for Treated Wood 2022.
- D. NLGA (SGRNL) Standard Grading Rules for Canadian Lumber 2017.
- E. PS 1 Structural Plywood 2009 (Revised 2019).
- F. PS 2 Performance Standard for Wood Structural Panels 2018.
- G. PS 20 American Softwood Lumber Standard 2021.
- H. SPIB (GR) Grading Rules 2014.

# 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide technical data on wood preservative materials.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

# 1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

# **PART 2 PRODUCTS**

#### 2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

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2. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

#### 2.02 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
  - 1. For Southern Yellow Pine (SYP).
- B. Grading Agency: National Lumber Grading Authority; NLGA (SGRNL).
  - For Spruce-Pine-Fir (SPF).
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: S-dry or MC19.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - Boards: Standard or No. 3.

# 2.03 CONSTRUCTION PANELS

- A. Wall Sheathing: PS 2 type.
  - 1. Bond Classification: Exterior.
  - 2. Grade: Structural I Sheathing.
  - 3. Span Rating: 24.
  - 4. Performance Category: 3/4 PERF CAT.
  - 5. Edge Profile: Square edge.
  - 6. Location: Plywood wainscot at Metal Storage Building, and elsewhere as indicated.
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
  - 1. In lieu of fire-retardant (FRTW) treatment, backboards may be painted on all sides and edges with an intumescent paint system as specified in Section 09 90 00.

# 2.04 ACCESSORIES

- A. Fasteners and Anchors:
  - Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, corrosion-resistant coated steel elsewhere.
  - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length to achieve full penetration of sheathing substrate.
  - 3. Anchors:
    - a. Toggle bolt type for anchorage to hollow masonry.
    - b. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
    - c. Bolt or ballistic fastener for anchorage to steel.

## 2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Fire-Retardant Treated Wood (FRTW): Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
  - 2. Preservative-Treated Wood (PT): Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment (FRTW):
  - 1. Manufacturers:
    - a. Lonza Group; "Dricon": www.wolmanizedwood.com.
    - b. Hoover Treated Wood Products, Inc; "Pyro-Guard": www.frtw.com.

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- c. Koppers Performance Chemicals, Inc: "FirePRO": www.koppersperformancechemicals.com.
- 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
  - Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
  - b. Treat rough carpentry items as indicated .
  - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

# C. Preservative Treatment (PT):

- 1. Manufacturers:
  - a. Lonza Group: www.wolmanizedwood.com.
  - b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com.
  - c. Viance, LLC: www.treatedwood.com.
- 2. Preservative Pressure Treatment (PT) of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
  - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
  - b. Treat lumber exposed to weather.
  - c. Treat lumber in contact with roofing, flashing, or waterproofing.
  - d. Treat lumber in contact with masonry or concrete.
  - e. Treat lumber less than 18 inches above grade.
  - f. Treat lumber in other locations as indicated.
- 3. Preservative Pressure Treatment (PT) of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
  - Kiln dry plywood after treatment to maximum moisture content of 19 percent.
  - b. Treat plywood in contact with roofing, flashing, or waterproofing.
  - c. Treat plywood in contact with masonry or concrete.
    - 1) Exceptions:
      - (a) Communications and electrical mounting boards shall be FRTW.
  - d. Treat plywood less than 18 inches above grade.
  - e. Treat plywood in other locations as indicated.

# **PART 3 EXECUTION**

# 3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

# 3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

# 3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

ROUGH CARPENTRY 06 10 00 - 3

- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Provide the following specific nonstructural framing and blocking:
  - Cabinets and shelf supports.
  - 2. Wall brackets.
  - 3. Handrails.
  - Grab bars.
  - 5. Towel and bath accessories.
  - 6. Wall-mounted door stops.
  - 7. Chalkboards and marker boards.
  - 8. Wall paneling and trim.
  - 9. Joints of rigid wall coverings that occur between studs.

# 3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.
- C. Wood Nailers: Provide wood nailers at all perimeters and other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.
  - 1. Install with 1/8 inch gap between each length and at each change of direction.
  - 2. Mechanically fasten to deck to resist force of 250 lbf per linear foot.
  - 3. Provide screw fasteners recommended by manufacturer for conditions encountered.

    Minimum fastener requirements for each wood nailer are as follows:
    - Space screws 18 inches o.c. maximum, with a minimum 1 inch thread embedment.
    - b. Use three anchors per length of wood nailer minimum.

# 3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
- B. Communications and Electrical Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  - At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  - 3. Install adjacent boards without gaps.
  - 4. Size and Location: As indicated on drawings.

# 3.06 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

# 3.07 TOLERANCES

A. Variation from Plane: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

# 3.08 CLEANING

A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

06 10 00 - 4 ROUGH CARPENTRY

B. Prevent sawdust and wood shavings from entering the storm drainage system.

# **END OF SECTION**

ROUGH CARPENTRY 06 10 00 - 5

# SECTION 06 20 00 FINISH CARPENTRY

# **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Finish carpentry items:
  - 1. Pegboard wall panels.
- B. Hardware and attachment accessories.

#### 1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 09 91 23 Interior Painting: Painting of finish carpentry items.

#### 1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Samples: Submit two samples of pegboard minimum 8 x 8 inch in size.

# 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect from moisture damage.
- C. Handle materials and products to prevent damage to edges, ends, or surfaces.

# **PART 2 PRODUCTS**

# 2.01 SHEET MATERIALS

A. Pegboard: Pressed wood fiber with resin binder, standard grade; 1/8 inch thick, with holes spaced at 1 inch on center in both directions.

# 2.02 FASTENINGS

A. Fasteners: Of size and type to suit application; ASTM A153 hot-dip galvanized finish with minimum 1 oz/sq ft zinc coating.

# 2.03 ACCESSORIES

A. Lumber for Perimeter Furring: See Section 06 10 00.

# 2.04 SITE FINISHING MATERIALS

A. Field Finishing: See Section 09 91 23.

#### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

#### 3.02 INSTALLATION

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

# 3.03 PREPARATION FOR SITE FINISHING

- Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 91 23.

FINISH CARPENTRY 06 20 00 - 1

# 3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION** 

06 20 00 - 2 FINISH CARPENTRY

# SECTION 06 41 00 ARCHITECTURAL WOOD CASEWORK

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.
- D. Preparation for installing utilities.
- E. Refurbishing of existing cabinet units and countertops where indicated.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 06 10 00 Rough Carpentry: Support framing, grounds, and concealed blocking.

#### 1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B. BHMA A156.9 Cabinet Hardware 2020.
- C. NEMA LD 3 High-Pressure Decorative Laminates 2005.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
  - 2. Provide information as required by AWI/AWMAC/WI (AWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and countertop substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls and hinges, demonstrating hardware design, quality, and finish.

## 1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Single Source Responsibility: Provide and install this work from single fabricator.

# 1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

#### 1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

## **PART 2 PRODUCTS**

#### 2.01 CABINETS

- Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.

## 2.02 LAMINATE MATERIALS

A. Manufacturers:

- 1. Arborite: www.arborite.com.
- 2. Formica Corporation: www.formica.com.
- 3. Panolam Industries International, Inc: www.panolam.com.
- Wilsonart LLC: www.wilsonart.com.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as indicated.
  - Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as indicated, finish as selected.
  - 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as indicated, finish as indicated.
  - 3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

#### 2.03 COUNTERTOPS

A. Plastic Laminate Countertops: Plywood substrate covered with HPDL, conventionally fabricated, with decorative vinyl countertop edge.

#### 2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Vinyl Countertop Edge: PVC anchor type tee-molding edging in width to match thickness of countertop, color as indicated.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chromeplated finish in exposed locations.
- E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

#### 2.05 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- C. Hinges: European style concealed self-closing type, steel with polished finish.

# 2.06 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
  - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
  - 2. Cap exposed plastic laminate finish edges with matching vinyl edge trim.
- E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

## PART 3 EXECUTION

# 3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

## 3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets and counter bases to floor using appropriate angles and anchorages.

## 3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

#### 3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

#### **END OF SECTION**

# SECTION 07 01 30 MAINTENANCE OF STEEP SLOPE METAL ROOFING

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- Protection of and modifications to existing steep slope metal roofing system, as required for maintenance work indicated.
- B. Pressure washing/cleaning of existing roof.
- C. Replacement of existing roof penetration flashings.
- D. Re-flashing of roof curbs.
- E. Re-flashing of roof rake-edge components.
- F. Replacement of exposed lightning system cable and rod bracket fasteners.
- G. Sealing between eaves of existing roof panels and new gutters, downspouts, and flashings installed under Section 07 71 23.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 07 56 00 Fluid-Applied Roofing: Acrylic roof coating system for metal roofs.
- C. Section 07 71 23 Manufactured Gutters and Downspouts.

#### 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with affected mechanical and electrical work associated with roof penetrations.
- B. Coordinate with installation of new gutters and downspouts; see Section 07 71 23.

## 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Installer's Qualification Statement.

## 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Maintenance/repair work shall be performed by a company with at least 3 years of successful experience in maintaining and repairing steep slope metal roofs with conditions similar to those encountered on this project.
- B. All modifications and/or repairs must be done in accordance with the instructions of manufacturers of products specified in this section..

## 1.06 FIELD CONDITIONS

- A. Do not roof maintenance work when weather conditions threaten the integrity of the building contents or intended continued occupancy.
- B. Maintain continuous temporary protection prior to and during performance of any new work and installation of any required roofing system modifications.

#### **PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. All materials used in modifications and/or repairs to existing roofing system shall be as recommended by the manufacturer for remediation of the conditions encountered.
- Metal Roof Flashings: Provide metal roof flashing systems of designs as appropriate for existing conditions.
  - 1. Manufacturer: DEKS North America, Inc: www.deksus.com; or approved equivalent.
    - a. Slip-Over Pipe Boots: Dektite Premium.
    - b. Retrofit Pipe Boots (to flash around, not over): Dektite Retrofit Original.
    - c. Flashing Around or Over: Dektite Combo.
    - d. Universal Trapezoidal SSR End Cap: Dektite UEC.

- e. Strip Flashing: Dekstrip Kit.
- f. Flexible Flashing: Dektite Fast Flash.
- g. Fasteners, Washers, Sealants & Adhesives: As recommended by manufacturer.
- C. Butyl Sealant Tape: 100% solids, asbestos-free butyl preformed tape sealant.
  - 1. Manufacturer: Gibraltar Industries: www.gibraltarbuildingproducts.com; or equivalent.
    - a. Size: 1/2 x 3/32 inch minimum. Provide larger size if recommended by installer.

#### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify that existing roof surface is clear and ready for work of this section.

#### 3.02 PREPARATION

- A. Sweep roof surface clean of loose matter.
- B. Pressure wash / clean the existing roof system to remove all oxidization, algae, etc.

#### 3.03 GENERAL

- A. Replace all existing roof penetration flashings with new "Dektite" penetration flashings.
- B. Re-flash all roof curbs by replacing all exposed fasteners utilizing new oversized fasteners with neoprene washers and installing new butyl tape sealants between the roof panels and curb flanges.
- C. Re-flash all rake edge components by replacing all exposed fasteners utilizing new oversized fasteners with neoprene washers and installing new butyl tape sealants between the roof panels and edge flashings.
- D. Replace the exposed lightning protection cable fasteners in the field of the roofs utilizing new oversized fasteners with neoprene washers set through large fender washers with new butyl tape installed between the roof panels and fender washers.
- E. Replace the exposed fasteners at the existing lightning protection rod brackets utilizing new oversized fasteners with neoprene washers and install new butyl tape sealants between the rod brackets and roof panels.
- F. (Coordinate this item with Section 07 71 23): Replace the existing gutters, downspouts, and metal edge roof flashings (eave trim) at all eave locations with new butyl tape sealants installed between the roof panels and eave trim. Ensure the new gutter edges are formed lower than the roof panels for emergency overflow protection.

## 3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Reports: If manufacturer's technical representative is required to make any site visits before, during, or after performance of roofing modifications, provide copies of any field reports to Architect and Owner.
- B. Owner's Roof Inspector will review finished work and issue a report of any deficiencies.
- C. Contractor shall promptly correct any deficiencies and request a reinspection.

#### **END OF SECTION**

## SECTION 07 19 00 WATER REPELLENTS

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

A. Water repellents applied to existing exterior concrete masonry unit (CMU) surfaces after cleaning.

## 1.02 RELATED REQUIREMENTS

- A. Section 04 01 00 Maintenance of Masonry: Cleaning of existing exterior CMU surfaces.
- B. Section 07 92 00 Joint Sealants: Re-sealing of EJs and CJs at existing exterior CMU walls.

## 1.03 REFERENCE STANDARDS

- A. ASTM D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- B. ASTM D5095 Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments 1991 (Reapproved 2022).

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- D. Manufacturer's Qualification Statement.
- E. Installer's Qualification Statement.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience

# 1.06 MOCK-UP

- A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
- B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.
- C. Locate where directed.
- D. Approved mock-up may remain as part of the Work.

# 1.07 FIELD CONDITIONS

- Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 90 degrees F.
- C. Do not apply water repellents when wind velocity is higher than 15 mph.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend Water Repellents:

WATER REPELLENTS 07 19 00 - 1

- 1. Basis of Design: United Gilsonite Laboratories; DRYLOK Siloxane 7 Brick and Masonry Penetrating Sealer: www.ugl.com.
- 2. Pecora Corporation: www.pecora.com.
- 3. PROSOCO, Inc: www.prosoco.com.
- 4. Sherwin-Williams Company: www.sherwin-williams.com.
- 5. Substitutions: See Section 01 60 00 Product Requirements.

## 2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Applications: Vertical exterior CMU surfaces, after cleaning.
  - 2. Number of Coats: Two.
  - VOC Content: Less than 10 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
  - 4. Maintains dry appearance when wetted.
  - Silane, siloxane, silane-siloxane blend that reacts chemically with concrete and masonry.

## **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent. See Section 04 01 00 for cleaning requirements.

## 3.02 PREPARATION

- A. Protection of Adjacent Work:
  - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
  - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Remove loose particles and foreign matter.
- D. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- E. Scrub and rinse surfaces with water and let dry.
- F. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

# 3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

#### **END OF SECTION**

07 19 00 - 2 WATER REPELLENTS

## SECTION 07 21 00 THERMAL INSULATION

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Fiberglass insulation and vapor retarder liner system retrofit at existing exterior wall and roof construction as indicated.

#### 1.02 RELATED REQUIREMENTS

A. Section 01 73 10 - Cutting and Patching.

# 1.03 REFERENCE STANDARDS

- A. ASTM C991 Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings 2016.
- B. ASTM C1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation 2021.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- D. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022.

## 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Shop Drawings: Provide shop drawings that indicate liner fabric layout, insulation layout, and cut list.
- D. Manufacturer's Installation Instructions: Include information on installation techniques.

#### 1.05 DESIGN REQUIREMENTS

A. The installed roof and wall systems shall provide a continuous vapor barrier.

## **PART 2 PRODUCTS**

#### 2.01 FIBERGLASS INSULATION AND VAPOR RETARDER LINER SYSTEM

- A. Thermal Insulation: Provide "OptiLiner Banded Liner System" as manufactured by Owens Corning: www.owenscorning.com; or approved equivalent.
  - 1. System shall consist of the following components:
    - a. Vapor Retarder Liner Fabric: A woven high-density polyethylene coated on both sides with polyethylene.
      - Classification: ASTM C1136, Type I VI, except for dimensional stability (value is <2.0%).</li>
      - 2) Perm Rating: ASTM E96/E96M, Method A: 0.02.
      - Surface Burning Characteristics: ASTM E84, Class A, with the following maximum characteristics:
        - (a) Flame Spread Index: 25.
        - (b) Smoke Developed Index: 50.
    - b. Galvanized metal support straps (bands), 1 inch wide, prefinished white color.
    - c. One or more layers of Owens Corning "EcoTouch Certified R Metal Building Insulation" as required to completely fill the space between the existing wall and roof insulation and the new vapor retarder liner.
      - 1) Classification: ASTM C991, Type I.
      - Surface Burning Characteristics: ASTM E84, Class A, with the following maximum characteristics:
        - (a) Flame Spread Index: 25.

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- (b) Smoke Developed Index: 50.
- d. Fasteners, adhesives, foam thermal break tape, double-faced tape, patching tape, base channels, insulation hangers, and other accessories as recommended by manufacturer.

#### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and liner system.
- B. Verify purlin and girt attachment surfaces are clean and dry prior to attaching two-faced tape or sealing adhesive.

## 3.02 FIBERGLASS INSULATION AND VAPOR RETARDER LINER SYSTEM INSTALLATION

- A. Insulation: Install liner system and insulation in accordance with manufacturer's recommendations and approved shop drawings to achieve specified insulation thicknesses.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install vapor retarder membrane liner facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

#### 3.03 CLEANING

A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Do not use solvent-base cleaners or abrasive pads.

# 3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

# **END OF SECTION**

07 21 00 - 2 THERMAL INSULATION

# SECTION 07 42 93 SOFFIT PANELS

#### **PART1 GENERAL**

## 1.01 SECTION INCLUDES

A. Aluminum soffit system, vented.

#### 1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry.

## 1.03 REFERENCE STANDARDS

- A. AAMA 609 & 610 Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- B. AAMA 1402 Standard Specification for Aluminum Siding, Soffit and Fascia; 2009.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.
- C. Samples: Submit two samples of soffit panel, 16 inches long, illustrating finish color, sheen, and texture.

#### 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 installing the products specified in this section with minimum three years of documented experience.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

# 1.07 WARRANTY

A. Correct defective work within a five year period after the Date of Final Acceptance for degradation of panel finish, including color fading caused by exposure to weather.

#### **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. Metal Soffit Panels:
  - 1. Rollex Corporation; Stealth Soffit Panel System: www.rollex.com.
  - 2. Substitutions: See Section 01 60 00 Product Requirements.

#### 2.02 MANUFACTURED METAL PANELS

- A. Soffit Panel System: Factory fabricated prefinished metal panel system, site assembled.
  - 1. Provide soffit panels and installation accessories.
  - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
  - 3. Design Pressure: In accordance with applicable codes.
  - 4. Net Free Area of Soffit Panel: 8.00 square inches per lineal foot.

SOFFIT PANELS 07 42 93 - 1

- Movement: Accommodate movement within system without damage to components, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
- 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects.
- 7. Panel Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over manufacturer's standard primer.
  - a. Color: As selected by Architect from manufacturer's standard colors.

#### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify that framing members are ready to receive panels.

#### 3.02 INSTALLATION

- A. Install panels at soffits in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Use concealed fasteners unless otherwise approved by Architect.

## 3.03 TOLERANCES

- Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

## 3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

**END OF SECTION** 

07 42 93 - 2 SOFFIT PANELS

## SECTION 07 56 00 FLUID-APPLIED ROOFING

## **PART 1—GENERAL**

## 1.01 SECTION INCLUDES

A. Acrylic roof coating system for metal roofs.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 07 01 30 Maintenance of Steep Slope Roofing

## 1.03 SCOPE OF WORK

A. Applicator shall provide all labor, equipment, and materials necessary to install the coating system. The manufacturer's most current Product Data Bulletins and installation instructions shall be observed in conjunction with this specification.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Submit Product Data Bulletins confirming physical and performance properties of the products.
- C. Submit Material Safety Data Sheets for all products to be used in the assembly.
- D. Submit a roof survey including measurements, descriptions of the condition (seams, penetrations, drains, gutters) and known leaks. Photographs of all shall be included in the submission.
- E. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- F. Independent Roof Inspector Qualifications: Submit for Owner's review and approval.
- G. Independent Roof Inspector Reports: Inspector shall submit daily reports to Architect, Contractor and Owner.
- H. Manufacturer's Installation Instructions: Include standard installation instructions, acceptable installation temperature range, and procedures for unusual perimeter conditions.
- I. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

## 1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in installation of fluid-applied roofing systems and approved by the system manufacturer.
- B. Contractor shall furnish all insurance, licenses, permits and certifications as required by local authorities and/or the Owner.
- C. Contractor shall insure that all work performed at the site shall be in accordance with National Roofing Contractors Association (NRCA) Low Slope Roofing Manual's recommendations and all other pertinent guidelines issued by the NRCA in reference to other types of construction present at the job site.
- D. Independent Roof Inspector: Contractor shall hire a third-party Roof Inspector acceptable to the Owner to provide full-time inspection during roofing work. The Inspector shall also provide a final inspection and follow-up inspections as required until final acceptance of the roofing work by the Owner.
- E. Supplier shall retain batch samples of all materials used in the system for a minimum of five years.

#### 1.06 FIELD CONDITIONS

A. The roof must be free of areas of ponded water, ice, snow, rain (or dew), oils, greases, particulate matter, or other debris.

- B. The roof surface must be a minimum of 50°F, ambient temperature must be a minimum of 40°F. The roof surface temperature should not exceed 120°F during application to avoid blisters and pinholes. Do not apply coating when the ambient temperature is within 5° F of the Dew Point.
- C. Coatings require mixing immediately prior to application. All containers shall be thoroughly mixed with a mechanical mixing device for a minimum of five minutes each. Coatings shall be mixed no more than four hours prior to use. Remixing is permitted as is necessary.
- D. No products with a Flash Point below 100° F shall be permitted due to the associated fire hazard.
- E. No products with chlorinated "Toxic Exempt" solvents including perchloroethylene, 111 trichloroethane, methylene chloride or isocyanates shall be utilized due to the associated health hazards to workers and building occupants.
- F. No asphalt or vegetable-based oils may be used in the production of any product included in this specification.
- G. Materials should be maintained at a minimum temperature of 50° F for 24 hours prior to application to ensure the optimal application qualities. Do not allow materials to freeze.

#### 1.07 WARRANTY

- A. Applicable warranty forms must be completed and submitted for approval prior to beginning the project.
- B. Provide manufacturer's Ten Year Full System Warranty, starting on the date of Final Acceptance of the Project. Warranty shall cover manufacturer's material defects, workmanship defects and labor costs required to remedy the defects, exclusively as related to failures of the water tightness of the coating system.
- C. Provide General Contractor's "State of Alabama Roofing Guarantee;" see Section 00 65 36.

## **PART 2—PRODUCTS**

## 2.01 MANUFACTURER

- A. Fluid-Applied Roofing: R. M. Lucas Co; TPS1000 Elastomeric Acrylic Coating System: www.rmlucas.com; or approved equivalent. System materials shall be equivalent to the following:
  - 1. Lucas #115 Universal Wash a biodegradable detergent wash suitable for cleaning and preparing all types of roof systems.
  - 2. Lucas #1500 Acrylic Mastic a brushable water-based acrylic elastomeric mastic.
  - 3. Lucas #1019 Rust Primer a water-based primer for preparing rusty metal roofs for a Lucas water-based elastomeric coating.
  - 4. Lucas #1000BC Elastomeric Base Coating a water-based 100% acrylic elastomeric base coating for multiple surfaces; also used to embed polyester fabric.
  - 5. Lucas #1000TC Elastomeric Roof Coating a water-based 100% acrylic elastomeric finish coating exhibiting a high degree of weather resistance and high solar reflectivity.
  - 6. Lucas #1900 Water-based Clear Sealant a water-based 100% acrylic elastomeric coating intended for waterproofing fiberglass roof panels and translucent skylights.
  - 7. Lucas White Polyester Reinforcing Fabric (X-Firm, Firm & Soft).
  - 8. Miscellaneous tools and equipment including 3/4" to 1 1/4" nap rollers with 6' handles, 4" brushes, roofer's trowels, scissors for cutting fabric, and a 1/2" power drill with mixing attachment.
  - 9. Spray equipment (optional) Graco 7900, Graco 733 or Graco 833 with 3/4" hose to 5/8" 25' long whip with a mastic gun and 635 tip.

#### **PART 3—EXECUTION**

## 3.01 INSPECTION

A. Prior to commencement of work, the roof shall be re-inspected. Any conditions not included in the roof survey shall be added and noted. All new information must be communicated to the manufacturer prior to starting work.

## 3.02 CONDITIONS AND REMEDIES

- A. The roof assembly must be structurally sound and free of blisters, shrinkage, buckling, encapsulated moisture, delaminating of plies or other serious defects. Any serious defects shall be remedied prior to the installation of the coating system.
- B. Drains must be installed as to allow positive drainage of the roof surface. No areas shall retain water more than 48 hours or at depths exceeding 1/4" at any time.
- C. Fasteners shall be inspected and tightened where loose. Replace as necessary according to original manufacturer or NRCA guidelines.
- D. Curbs and penetrations must not interrupt the flow of water off the roof. If defects are present, install crickets to divert water around the penetrations.
- E. Flashings shall be properly terminated according to NRCA guidelines. Defective terminations shall be remedied. Flashings that are shrunken, taught or tented shall be replaced prior to installation of the coating system.

## 3.03 SURFACE PREPARTION

- A. Mechanically remove all loose coatings and/or patching material as is possible. On metal surfaces, wire brush to remove any areas of scaly rust.
- B. The roof surface shall be cleaned with Lucas #115 Universal Wash according to manufacturer's most current Product Data Bulletin. Dilute the material with water at the rate of four parts water to one part #115. Apply #115 to a wet roof surface with a mop, pump sprayer or other suitable low-pressure sprayer at the rate of one gallon per 100 square feet. Do not let cleaner dry on the roof, keep wet at all times. Avoid contact with painted surfaces or vinyl siding. Allow wet contact with the roof surface for a minimum of 15 minutes. Agitate roof surface with stiff bristle broom or orbital scrubber.
- C. Rinse the roof surface thoroughly with clean water and a minimum 2000 psi power washer until no #115 residue remains. Use caution to avoid saturating roof. Allow roof to dry completely prior to system installation.
- D. All rust must be primed with Lucas #1019 Rust Primer applied at the rate of 1 gallon per 200 square feet.
- E. Allow 24 hours before top coating.

# 3.04 WATERWAY, PENETRATION, FLASHING, AND FIELD REINFORCEMENT

- A. Remove any contamination or debris that has accumulated.
- B. Seams shall be sealed with Lucas #1500 Acrylic Mastic applied at 1/8" thickness and extending a minimum of 1" to either side of the seam. Apply Lucas #1500 on vertical seams at a minimum of 1.5" wide x 1/8" thick and horizontal seams at a minimum of 4" wide x 1/8"-3/16" thick (tapered all edges). Seams with cover tape, asphalt mastic, etc. must be sealed with polyester reinforcing fabric. The overlap on both sides of the seam must be a minimum of three inches +/- 1/2". All rolls are 300' long. Apply Lucas #1500 at 1.5 gallons per 100 square feet and immediately embed fabric. Dry brush the fabric smooth. Allow a minimum of one hour dry time. Apply an additional 1.5 gallons of Lucas #1500 on top of the fabric to fully encapsulate it.
- C. Fasteners shall be sealed with Lucas #1500 Acrylic Mastic. Each fastener shall be completely covered by the sealant. One gallon will seal approximately 400 fasteners.

1500 Acrylic Mastic	Seams - 1.5" wide x 1/8" thick	Fasteners

One gallon	~130 linear feet	~400
10 oz. cartridge	~10 linear feet	~33

- D. All field defects, ponded water areas, flashing defects or previous repairs must be reinforced with polyester reinforcing fabric. Available widths for field reinforcement include 6", 12", 20" and 40". Apply Lucas #1000BC at 1.5 gallons per 100 square feet and immediately embed fabric. Dry brush the fabric smooth. Allow a minimum of one hour dry time. Apply an additional 1.5 gallons of #1000BC on top of the fabric to fully encapsulate it.
- E. Install a 40" x 40" piece of white polyester reinforcing fabric over all drains, after removing the clamping ring if present. Apply Lucas #1000(BC or MB) at a rate of 1.5 gallons per 100 square feet and immediately embed fabric. Dry brush the fabric smooth. Allow a minimum of one hour dry time. Apply a second coat of #1000(BC or MB) at a rate of 1.5 gallons per 100 square feet to the top of the fabric to fully encapsulate it. Cut an X pattern in the polyester reinforcing fabric and fold it into the drain.
- F. Penetrations that cannot be sealed with polyester reinforcing fabric, due to their shape or location, shall be reinforced with Lucas #1500 Acrylic Mastic. Apply with a brush or trowel (1/8" thick to 1/4" thick) and taper all edges.
- G. Allow 24 hours before top coating.

## 3.05 COATING INSTALLATION

- A. Install fluid-applied roofing system in accordance with manufacturer's instructions and recommendations, to specified minimum thickness.
- B. Apply roofing materials to surfaces that are acceptable to manufacturer.
- C. Remove any contamination or debris that has accumulated on the roof after cleaning.
- D. To restore existing skylights, apply one coat of Lucas #1900 Water-based Clear at a rate of 1 gallon per 100 square feet. Allow 4 hours dry time. Apply a second coat of Lucas #1900 Water-based Clear at a rate of 1 gallon per 100 square feet.
- E. Apply one base coat of Lucas #1000BC Elastomeric Base Coating at the rate of 1 gallon per 100 square feet (16 wet mils). Apply a finish coat of Lucas #1000TC Elastomeric Roof Coating at the rate of 1 gallon per 100 square feet (16 wet mils). Extra material is required for the height of the ribs, verify with field measurement (e.g., a standard low profile R panel requires approximately 15% extra coating material per 100 square feet). Material is extremely fast drying. Do not distribute excessive amounts onto the roof prior to rolling. Do not over roll while drying or a textured finish will result. When spraying, use a multi-pass technique for even coverage. Protect unintended surfaces from overspray.
- F. Walkways: At light traffic areas, apply coat of #1000TC at a rate of 1 gallon per 100 sq. ft. and immediately apply Lucas #402 EPDM Granules into wet coating at the rate of 15lbs. per 100 square feet. Do allow coating to skin over or the granules will not adhere. Vacuuming is recommended once coating is cured in order to remove loose granules to avoid accumulation in gutters and drains.

# 3.06 INSPECTION

- A. The Independent Roof Inspector shall be present at all times roofing work is being done. The Inspector shall verify that roofing is installed in accordance with manufacturer's recommendations and these specifications. He shall provide a daily report to the Architect, Contractor, and Owner.
- B. Inspect the roof for even and adequate coverage. Dry film thickness of the coating (fabric reinforcement not included) should be a minimum 16 mils DFT for a 10-year system. Areas of under-application shall receive additional coating to meet the minimum film thickness requirements. Any vapor pockets, fish mouths or loose bond in reinforced areas shall be split, flattened and reinforced a second time.

#### **END OF SECTION**

# SECTION 07 71 23 MANUFACTURED GUTTERS AND DOWNSPOUTS

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

#### 1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry: Wood blocking and nailers.
- B. Section 07 01 30 Maintenance of Steep Slope Roofing.

## 1.03 REFERENCE STANDARDS

- A. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2020, with Errata (2022).
- B. ANSI/SPRI GD-1 Structural Design Standard for Gutter Systems Used with Low-Slope Roofs; 2010.
- C. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. SMACNA (ASMM) Architectural Sheet Metal Manual 2012.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Comply with applicable code for size and method of rain water discharge.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- D. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

#### 1.06 QUALITY ASSURANCE

A. Gutter system shall be certified by the manufacturer to have been tested to meet the requirements of ANSI/SPRI Standard GD-1.

# 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

#### 1.08 WARRANTY

- A. Manufacturer's Special Performance Warranty: Provide gutter manufacturer's warranty agreeing to repair or replace the gutter system if it is damaged or blown off due to wind conditions up to 125 mph.
  - 1. Warranty Term: 20 years, starting on the date of Final Acceptance of the Project.
  - 2. For repair or replacement include costs of both material and labor in warranty.

#### **PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

- A. Gutters and Downspouts:
  - 1. ATAS International, Inc; Ultra HP Gutter: www.atas.com.

- 2. Metal Era, Inc; Seal-Tite Gutter System, IG-1 Version: www.metalera.com.
- 3. OMG Roofing Products; Wind Resistant Offset Gutter: www.omgroofing.com.

#### 2.02 MATERIALS

- A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc or equivalent Galvalume coating.
  - 1. Thickness:
    - a. Gutters: 22 gage.
    - b. Downspouts: 24 gage.
  - 2. Finish: Shop pre-coated with PVDF (polyvinylidene fluoride) coating.
  - 3. Color: As selected from manufacturer's standard colors.
- B. Protective Backing Paint: Zinc molybdate alkyd.

## 2.03 COMPONENTS

- A. Gutters: Profile as indicated.
  - Sizes: As determined by SMACNA (ASMM) calculations; but not less that the following:
    - a. Typical Gutter: 6-3/4 inch bottom dimension and 6 inch face height dimension.
    - b. Gutter face height shall be 1-1/2 inches less than edge of adjacent roof.
  - 2. Brackets: 1 inch wide, 2-piece, extruded aluminum internal brackets located at 24 inches on center, or equivalent design as required to achieve specified wind resistance.
  - 3. Expansion Joints: Provide prefabricated expansion joints at intervals not exceeding 40 feet maximum for long runs, at locations as recommended by manufacturer.
  - Accessories: Provide corners, end caps, expansion joints, etc., fabricated by the gutter manufacturer.
- B. Downspouts:
  - 1. Size: As determined by SMACNA (ASMM) calculations, but not less that the following:
    - a. 5 inch face width x 5 inch side depth.
  - 2. Accessories:
    - a. Provide factory-fabricated starter tubes and elbows as required for each downspout.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
  - 1. Anchoring Devices: Type recommended by fabricator.
  - 2. Gutter Supports: Brackets.
  - 3. Downspout Supports: Straps, 1 inch wide.
    - a. Provide 2 straps per 10'-0" of downspout.
- D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

# 2.04 ACCESSORIES

A. Splash Blocks: Precast concrete type, 12 x 30 inch minimum size; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

## 2.05 FABRICATION

- A. Form gutters and downspouts of profiles and sizes indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

#### 2.06 FINISHES

A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

## **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

# 3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

# 3.03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- Fasten gutters and downspouts to supporting structure as required to achieve specified wind resistance.
- C. Space new downspouts as indicated on drawings.
- D. Set one splash block under each new downspout, where connections to existing storm sewer system do not exist.

## **END OF SECTION**

# SECTION 07 84 00 FIRESTOPPING

## **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 73 10 Cutting and Patching.
- B. Section 09 21 16 Gypsum Board Assemblies: Gypsum wallboard fireproofing.

## 1.03 REFERENCE STANDARDS

- ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- B. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- C. ASTM E2174 Standard Practice for On-Site Inspection of Installed Firestop Systems 2020a.
- D. ASTM E2393 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2020a.
- E. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).
- F. ITS (DIR) Directory of Listed Products current edition.
- G. FM 4991 Approval Standard of Firestop Contractors 2013.
- H. FM (AG) FM Approval Guide current edition.
- I. SCAQMD 1168 Adhesive and Sealant Applications 1989, with Amendment (2017).
- J. UL 1479 Standard for Fire Tests of Penetration Firestops Current Edition, Including All Revisions.
- K. UL (DIR) Online Certifications Directory Current Edition.
- UL (FRD) Fire Resistance Directory Current Edition.

# 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Certificate from authority having jurisdiction indicating approval of materials used.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.

#### 1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

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- Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an
  acceptable test report.
- 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
  - Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
  - 2. Verification of minimum three years documented experience installing work of this type.
  - 3. Verification of at least five satisfactorily completed projects of comparable size and type.
  - 4. Licensed by local authorities having jurisdiction (AHJ).
  - 5. Approved by firestopping manufacturer,

#### 1.06 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
  - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
  - 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
- B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.
- C. If accepted, mock-up will represent minimum standard for this work.
- D. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

# 1.07 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

# **PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
  - 1. 3M Fire Protection Products: www.3m.com/firestop.
  - 2. A/D Fire Protection Systems Inc: www.adfire.com.
  - 3. Hilti, Inc: www.us.hilti.com.
  - 4. Nelson FireStop Products: www.nelsonfirestop.com.
  - 5. Specified Technologies Inc: www.stifirestop.com.

#### 2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

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#### 2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
  - 1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

# 2.04 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
  - Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

## **PART 3 EXECUTION**

## 3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

#### 3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing or damming materials to prevent liquid material from leakage.

#### 3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.
- C. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- D. Install labeling required by code.

## 3.04 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

#### 3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

## 3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

**END OF SECTION** 

FIRESTOPPING 07 84 00 - 3

## SECTION 07 92 00 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. Re-sealing of EJs and CJs at existing exterior CMU walls.

## 1.02 RELATED REQUIREMENTS

- A. Section 04 01 00 Maintenance of Masonry.
- B. Section 07 84 00 Firestopping: Firestopping sealants.
- C. Section 08 71 00 Door Hardware: Setting exterior door thresholds in sealant.
- D. Section 09 21 16 Gypsum Board Assemblies: Acoustical sealant.
- E. Section 09 30 00 Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.
- F. Section 09 51 00 Acoustical Ceilings: Acoustical sealant for perimeter moldings.

#### 1.03 REFERENCE STANDARDS

- A. ASTM C1193 Standard Guide for Use of Joint Sealants 2016.
- B. ASTM C1521 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes 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. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
  - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
  - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
  - 8. Sample product warranty.
  - 9. Certification by manufacturer indicating that product complies with specification requirements.
- 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.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

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- C. Field Quality Control Plan:
  - 1. Visual inspection of entire length of sealant joints.
- D. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

## 1.06 WARRANTY

- A. See Section 01 78 00 Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period starting on the date of Final Acceptance of the Project.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
  - 1. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us.
  - 2. Pecora Corporation: www.pecora.com.
  - 3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
  - 1. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us .
  - 2. Pecora Corporation: www.pecora.com.
  - 3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.

#### 2.02 JOINT SEALANTS - GENERAL

A. Colors: As selected by Architect from manufacturer's standard colors.

#### 2.03 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  - 1. Type for All Joints: ASTM C1330; Type C Closed Cell Polyethylene.
  - 2. Closed Cell: 25 to 33 percent larger in diameter than joint width.
  - Manufacturers:
    - a. Nomaco, Inc; HBR: www.nomaco.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

## 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. Verify that backer rods are of the correct size.

07 92 00 - 2 JOINT SEALANTS

#### 3.02 PREPARATION

- 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 inconspicuous area to verify that it does not stain or discolor slab.
- F. Existing Exterior CMU Walls: After walls have been cleaned (see Section 04 01 00), rake out sealant from existing CMU expansion joints and control joints in preparation for installation of new backer rod and sealant under this section.

## 3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. 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.
- Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. 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.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

## 3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

#### 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.

**END OF SECTION** 

JOINT SEALANTS 07 92 00 - 3

# SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- A. Rated and non-fire-rated steel doors and frames.
- B. Thermally insulated hollow metal doors with frames.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 08 33 23 Overhead Coiling Doors.
- C. Section 08 71 00 Door Hardware.
- D. Section 09 91 13 Exterior Painting: Field painting.
- E. Section 09 91 23 Interior Painting: Field painting.

#### 1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SDI: Steel Door Institute.
- G. UL: Underwriters Laboratories.

#### 1.04 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design 2010.
- B. ANSI/ICC A117.1 American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. ANSI/SDI A250.6 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.
- D. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- E. ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- G. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- H. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- J. ASTM C476 Standard Specification for Grout for Masonry 2020.
- K. BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames 2016.
- L. ICC A117.1 Accessible and Usable Buildings and Facilities 2017.
- M. ITS (DIR) Directory of Listed Products current edition.
- N. NAAMM HMMA 830 Hardware Selection for Hollow Metal Doors and Frames 2002.
- O. NAAMM HMMA 831 Hardware Locations for Hollow Metal Doors and Frames 2011.

- P. NAAMM HMMA 840 Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
- Q. NAAMM HMMA 861 Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- R. NFPA 80 Standard for Fire Doors and Other Opening Protectives 2022.
- S. NFPA 252 Standard Methods of Fire Tests of Door Assemblies 2022.
- T. SDI 117 Manufacturing Tolerances for Standard Steel Doors and Frames 2019.
- U. UL (DIR) Online Certifications Directory Current Edition.
- V. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

## 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, frame profiles, and identifying location of different finishes, if any.
- Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

## 1.07 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.
  - 2. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com.
  - 3. Mesker, dormakaba Group: www.meskeropeningsgroup.com.
  - 4. Steelcraft, an Allegion brand: www.allegion.com.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
  - Steel Sheet: Comply with one or more of the following requirements; galvannealed 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. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
- 4. Door Edge Profile: Hinged edge square, and lock edge beveled.
- 5. Typical Door Face Sheets: Flush.
- 6. Door Thickness: 1-3/4 inches, unless otherwise indicated.
- 7. Door Core: Polyurethane, except where mineral fiberboard core required for fire rating.
- 8. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- 9. 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. Provide at least A40/ZF120 (galvannealed) for typical interior door applications, and at least A60/ZF180 (galvannealed) for exterior locations.
- B. 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 STEEL DOORS

- A. Exterior Doors: Thermally insulated.
  - Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless (16 gage).
  - 2. Door Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate.
  - 3. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:
  - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless (16 gage).
  - 2. Core Material: Polyurethane.
  - 3. Door Finish: Factory primed and field finished.
- C. Fire-Rated Doors:
  - Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless (16 gage).
  - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
    - a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
    - b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - c. Attach fire rating label to each fire rated unit.
  - 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
  - 4. Door Finish: Factory primed and field finished.

## 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. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
  - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
  - 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.

- 3. Weatherstripping: Integral, recessed into frame edge.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
  - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Door Frames, Fire-Rated: Full profile/continuously welded type.
  - Fire Rating: Same as door, labeled.
  - 2. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
  - 3. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- H. 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.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.06 ACCESSORIES

- A. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
  - 1. Manufacturers: Equivalent to the following:
    - a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series: www.ITWBuildex.com.
- B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- C. 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.
- D. 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

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

## 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. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.

- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 71 00.
  - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- F. Coordinate installation of electrical connections to electrical hardware items.
- G. Touch up damaged factory finishes.

## 3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

## 3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- Adjust doors with automatic door bottom sweeps so that seals are fully engaged when door is closed.
- C. Test doors with automatic door bottom sweeps for force to close, latch, and unlatch in accordance with ASTM E1408; adjust as required to comply.

## 3.06 SCHEDULE

A. Refer to Door and Frame Schedules on the drawings.

**END OF SECTION** 

## SECTION 08 33 23 OVERHEAD COILING DOORS

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Exterior coiling doors.
- B. Electric operators and control stations.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 05 50 00 Metal Fabrications: Steel frame at perimeter of openings.
- C. Section 07 92 00 Joint Sealants: Sealing joints between frames and adjacent construction.
- D. Division 26 Electrical.

#### 1.03 REFERENCE STANDARDS

- ASCE 7-10 Minimum Design Loads and Associated Criteria for Buildings and Other Structures 2010.
- B. ASTM A36/A36M Standard Specification for Carbon Structural Steel 2019.
- C. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. NEMA MG 1 Motors and Generators 2021.
- E. UL 325 Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats of each type, illustrating shape, color and finish texture.
- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

#### 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 type specified and with at least three years documented experience.

#### **PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
  - 1. Basis of Design: Overhead Door Corporation: www.overheaddoor.com.
  - 2. Cornell Iron Works, Inc: www.cornelliron.com.
  - 3. Raynor Garage Doors: www.raynor.com.
  - 4. Substitutions: See Section 01 60 00 Product Requirements.

# 2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.

- 1. Product/Manufacturer: Model 625 Series Stormtite Insulated Rolling Service Door, manufactured by Overhead Door Corp; or approved equivalent.
- 2. Capable of withstanding positive and negative wind loads without undue deflection or damage to components.
  - a. Design Pressure: In accordance with ASCE 7-10 and local code requirements.
- 3. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 7.7.
- 4. Nominal Slat Size: 2-5/8 inches wide x required length, flat face.
- 5. Finish: Galvanized, with powder coating finish in color as selected by Architect from manufacturer's standard colors.
- 6. Guide, Angles: Galvanized steel.
- 7. Hood Enclosure: Manufacturer's standard; galvanized steel, with power coating finish.
- 8. Electric operation, with emergency chain hoist operation.
- 9. Mounting: Interior face mounted.
- 10. Locking Devices: Slide bolt on inside.

## 2.03 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking slats.
  - 1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
  - Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
    - Jamb Seals: Provide supplemental jamb weatherstripping as detailed on drawings.
    - b. Lintel Seal: Double brush seal with EPDM sandwiched between the two brush seals at door header to impede air flow.
- B. Steel Slats: Minimum thickness, 24 gage; ASTM A653/A653M galvanized steel sheet.
- C. Guides Angle: ASTM A36/A36M metal angles, size as required for wind loading.
  - Hot-dip galvanized in compliance with ASTM A123/A123M.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
  - Minimum thickness; 24 gage.
  - 2. Galvanized steel, with manufacturer's standard factory powder coat finish, in standard color as selected by Architect.
- E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

#### 2.04 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
  - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
  - Basis of Design: Equivalent to the following, as manufactured by Overhead Door Corp.
    - Non-Fire-Rated Doors: Model RHX, heavy duty motor with industrial worm gear in oil bath design.
  - 2. Mounting: Front of hood.
  - 3. Motor Enclosure:
    - a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
  - 4. Motor Rating: As recommended by manufacturer: continuous duty.
  - 5. Motor Voltage: Refer to electrical drawings.

- C. Control Station: Provide standard three button (Open-Close-Stop) continuous-constant control device for each operator complying with UL 325.
  - 1. 24 volt circuit.
  - 2. Surface mounted, at interior and exterior door jamb locations.
  - 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    - a. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along with continuous-constant control device.
- D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

## **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

## 3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Division 26 requirements.
- F. Complete wiring from disconnect to unit components.
- G. Install enclosure and perimeter trim.

# 3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

# 3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

# 3.05 CLEANING

- Clean installed components.
- B. Remove labels and visible markings.

# **END OF SECTION**

# SECTION 08 71 00 DOOR HARDWARE

## **PART 1 - GENERAL**

#### 1.01 SECTION INCLUDES

- A. The work in this section shall include the furnishing of all items of door hardware as hereinafter specified, or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specification.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 RELATED REQUIREMENTS

A. Section 08 11 13 – Hollow Metal Doors and Frames.

#### 1.03 DEFINITIONS

A. Door Hardware: Hardware used in building construction but particularly that used on or in connection with doors, frames, cabinets, and other movable members. It also has a finished appearance as well as functional purpose and may be considered as a part of the decorative treatment of a room or building.

#### 1.04 QUALITY ASSURANCE

- A. Hardware has been specified herein by manufacturers' name, brand, and catalog numbers for the purpose of establishing a basis for quality, finish, design, and operational function.
- B. To ensure a uniform basis of acceptable materials, it is the intention that only manufacturers' items specified as "accepted and approved" be furnished for use on this project.
- C. Deviation from or modification of items will be permitted only for special instances caused by reason of construction characteristics and for the purpose of providing proper operational function. The contractor shall be responsible for checking any necessary deviations in order that hardware shall fit and function properly.
- D. Substitutions: Request for substitutions of items of hardware other than those listed as "accepted and approved" shall be made to the architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be given in writing or by Addenda. Requests for substitutions shall be accompanied by detailed information for each manufacturer of each product showing design, functions, material thickness and any other pertinent information needed to compare your product with that specified.
- E. Supplier: A recognized builders hardware supplier whose principal office and place of business is located within 150 miles of the project site, who has been furnishing hardware in the project's vicinity for a period of not less than five (5) years; and who is, or has in full time employment an Architectural Hardware Consultant (AHC) in good standing as certified by the American Society of Architectural Hardware Consultants, or equivalent, and who is a direct distributor of the products approved, for warranty purposes. This paragraph will be strictly enforced. All schedules shall be signed by an AHC.
- F. Products and installation under the work of this Section shall comply with, in part, at least the more stringent provisions of the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:
  - 1. Americans With Disabilities Act of 1990 (ADA) "Accessibility Guidelines" (ADA-AG).
  - 2. "2010 ADA Standards for Accessible Design", Published in the Federal Register September 15, 2010.
  - 3. American National Standards Institute (ANSI), ANSI A 117.1, 2003.
  - 4. "Uniform Federal Accessibility Standards" (UFAS).
  - 5. International Building Code, either the latest edition or latest adopted edition of the locality as applicable at the project locale.
  - 6. Where this requires any substitution of products specified herein, advise Architect in writing for necessary approvals.

DOOR HARDWARE 08 71 00 - 1

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. The door hardware supplier shall, after award of a formal contract submit to the architect, six (6) complete computerized or typewritten (handwritten are not acceptable) copies of the proposed door hardware schedule for approval. The schedule shall be prepared using the "sequence and format" for the Door and Hardware Institute (DHI). After approval of the schedule the hardware supplier shall provide three (3) copies of this approved schedule to the contractor for file and distribution purposes. Hardware will not be ordered by the hardware supplier until an approved schedule has been received. Horizontal schedules will not be acceptable. Provide vertical format.
- C. When submitting schedules for approval, include two manufacturers' cut sheets on each hardware item proposed. Index it with the use of number or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in right hand column on the same line as the respective manufacturers' numbers. All manufacturers' numbers shall be indexed even when appearing more than once.
- D. Templates: The hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce, or otherwise prepare their material or product to receive the hardware item. If physical hardware is required by any manufacturer the hardware supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. All items of hardware to be delivered to the job site shall be of completely packaged with all necessary screws, bolts, miscellaneous parts, instructions, and where necessary installation templates for manufacturers' suggested installation. All boxes are to have a typed label with door hand, room location, item number and keying to conveniently identify them and their intended location in the building.
- B. A representative of the Contractor shall receive the hardware when delivered at the job site. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting, checking and storage.
- C. Door hardware shall be delivered to the Contractor by the hardware supplier. Direct factory shipments to the job site are not acceptable.
- D. The hardware shall be jointly inventoried by the representative of the Contractor and the hardware supplier.
- E. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the Contractor.
- F. All hardware shall be handled in a manner to minimize marring, scratching or damage.

# 1.07 WARRANTY

- A. Provide manufacturers warranties from hardware supplier as follows, starting on the date of Final Acceptance of the Project:
  - 1. Closers: Ten years
  - 2. Exit Devices & Locksets: Three years
  - 3. Locksets: Three Years.
  - 4. All Other Hardware: One year.
- B. The above warranties shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall they serve as a limitation to other remedies available to the Owner.

### **PART 2 - PRODUCTS**

# 2.01 ACCEPTABLE MANUFACTURERS

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware are indicated in the hardware schedule at the end of this section.

08 71 00 - 2 DOOR HARDWARE

#### 2.02 FINISH OF HARDWARE

A. Finish of hardware items to conform to ANSI A156.18 unless otherwise specified. Unless specified otherwise in the hardware sets, and shall be as follows:

Butt Hinges:	Exterior 630, Interior 652
Locks:	US26D, satin chrome
Lock Cylinders:	US26D, satin chrome
Exit Devices:	US26D, w/satin stainless steel touch bars
Surface Closers:	689 powder coat painted aluminum
Flat Goods:	630, satin stainless steel
Threshold:	628
Weatherstrip (Adhesive):	Bronze or Black
Weather Strip (Metal Retainer):	628

#### 2.03 HINGES

- A. Templates Hinges: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template hinges which conform to ANSI whenever applicable.
- B. Hinge pins, except as otherwise indicated, shall be as follows:
  - 1. Steel Hinges: Steel Pins
  - 2. Non-Ferrous Hinges: Stainless Steel Pins
  - 3. Exterior Doors: Non-Removable Pins (NRP) or Security Stud
  - Out-Swing Corridor Doors: Non-Removable Pins (NRP), whether specified in the hardware sets or not.
  - 5. Interior Doors: Non-Rising Pins
  - 6. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip indicated.
- C. Where projection of door trim is such as to prevent desired degree of opening, the proper hinge width shall be provided to allow the door to clear the trim.
- D. Acceptable and approved only as follows:
  - 1. Ives \*
  - 2. Bommer USA
  - Hager

# 2.04 CYLINDERS, KEYS AND KEYING

- A. Master key all lock cylinders to the Owner's existing master key system. Existing cylinders are Marshall Best small format key interchangeable core (SFIC). Provide a new lock cylinder housing and permanent core for all new locks and exit devices. Match existing cylinder keyway in use at the facility. Provide cylinder housings with the collars, cams and tail pieces as required to operate the specified locks and exit devices. Specific keying requirements are to be determined at a meeting between the Owner and the door hardware supplier.
- B. Provide temporary brass construction use cores for all lock cylinders. At the completion of the project, the Contractor shall remove all construction use core sand install all new permanent cores. Contractor shall return all construction cores to the door hardware supplier.
- C. Stamping: Stamp all keys with their assigned key set symbols. Stamp all permanent cores in a concealed location with their assigned key set symbol. Stamp all permanent keys with the notation: "Do Not Duplicate".
- D. Key Quantities:
  - 1. 5 each master keys per MK group created
  - 2. 2 each operating keys per lock cylinder.
  - 3. 50 each key blanks

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### 2.05 LOCKSETS & LATCHSETS

- A. Accepted and approved as follows:
  - Falcon MA Series, LGN Design \*
  - 2. Schlage L9000 Series, LON-N Design
  - 3. Corbin ML2000 Series, ESM Design
- B. Provide function specified in the door hardware sets. All locks shall be equipped with strike dust boxes. Strike size shall be ASA 4 7/8". All locks shall be ANSI grade 1, UL listed for fire door use.

# 2.06 CLOSERS

- A. Accepted and approved only as follows:
  - 1. LCN 4000 Series
  - 2. Sargent 281 Series
  - 3. Falcon SC71A Series \*
  - 4. Provide series types as specified in the door hardware sets.
- B. All closers shall be mounted on interior side of rooms.
- C. All closers shall have full covers, cast aluminum or cast-iron bodies. All regular arm mounted closers shall have forged steel arms. Parallel arm mounted door closers shall have forged steel arms equal Falcon "FA". Closers shall be capable of adjustment as required to meet all ADA-AG opening force requirements. Closer case piston diameter shall be minimum 1-1/2".
- D. All closers shall be U.L. listed and shall meet ANSI Grade 1 requirements.

## 2.07 FLAT GOODS

- A. Accepted and approved only as follows:
  - 1. Ives \*
  - 2. Trimco
  - Hiawatha
- B. It is the responsibility of the hardware supplier to provide proper screw attachments per wall or floor conditions for door stops.
- C. Provide stops for each and every interior and exterior opening. Wall stops shall be of cast brass or bronze plated finish to match lock trim finish.
- D. Kickplates and armor plates shall be equal to Ives "8400 series" and shall be mounted by sheet metal screws where indicated in hardware sets. All kick plates shall be .050" satin stainless steel, beveled all 4 edges, with screw holes drilled. Shape of screw head shall be conical to provide near complete countersink. Pan-head screws or substitution of manufacturer supplied screws will not be acceptable.
- E. Where kick or armor plate height conflicts with specified door lite kits or louvers, supplier shall adjust plate height dimension to clear products as needed.

# 2.08 THRESHOLDS AND WEATHERSTRIPPING

- A. Accepted and approved as follows:
  - 1. Zero \*
  - 2. National Guard
  - 3. Reese

#### 2.09 EXIT DEVICES

- A. Accepted and approved as follows:
  - 1. Von Duprin 98 series
  - 2. Sargent 8000 Series
  - 3. Falcon 25/19 Series \*
  - 4. Provide series types as specified in the door hardware sets.

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B. Provide functions specified in the door hardware sets. All exit devices shall be UL listed for panic. Exit devices shall be UL listed for fire where specified in hardware sets and as shown on drawing door schedule.

### **PART 3 - EXECUTION**

## 3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware" by the Door and Hardware Institute (DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the disabled or handicapped, or if otherwise directed by the Architect.
- B. Degree of opening for doors with overhead holders, closers, etc., shall be included in the hardware schedule for the Architect's approval.
- All hardware shall be installed by tradesmen skilled in the application of commercial grade hardware.
- D. Install each hardware item in compliance with the instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted and finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finishes have been completed on the surface to which the hardware is to be applied.
- E. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the Owner when the building is accepted. Included shall be at least five each of any special adjusting and/or installation tools furnished with the hardware by the manufacturers.

#### 3.02 ADJUSTING AND CLEANING

- A. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- B. Final Adjustment: Wherever hardware installation is made more than one month prior to building acceptance or occupancy of a space or area. The installer shall return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Hardware shall be cleaned as necessary to restore current operation, function, and finish. Door control devices shall be adjusted to compensate for final operation of heating and ventilating equipment.

# 3.03 PROTECTION

A. Whenever hardware is located in areas where it may be subject to damage during construction by handling, cleaning, etc., (e.g., painting, cleaning of bricks) it shall be protected and/or removed from its location until the hazardous condition is terminated.

## 3.04 GENERAL NOTES

- A. Before installation of any hardware begins the Contractor's installer shall contact the hardware supplier to discuss any special installation requirements for all hardware items. Their discussion shall include, but not be limited to such items as proper closer mounting, proper fasteners to be used for hardware, locksets and exit device backsets, etc.
- B. Electric power tools should be used on hardware fasteners so as to prevent damage to screw heads.
- C. Hardware supplier should verify all quantities in the following schedule.

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#### 3.05 SCHEDULES

- A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards of practice, or to meet state and local codes shall be furnished whether or not specifically called out in the following listed groups.
- B. Supplier shall supply hardware for every numbered opening, whether specified in the above hardware sets or not. Hardware shall be same as similar openings.
- C. EXISTING CONDITIONS: New door hardware has been specified with goal to fit existing frames/doors with no modification where possible, <u>but this is not guaranteed</u>. The door hardware on existing materials scheduled to be re-used. Where required by existing conditions the hardware supplier shall coordinate and provide special template butt hinges, special template strikes for locks, door/frame cover plates, door/frame filler plates, as required to cover existing screw holes and preparations not covered by the new replacement door closers, locksets and exit devices.

## **HARDWARE SETS**

# HARDWARE SET: 01 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

DOC	OR NUMBER:			
	M1			

# **EACH TO HAVE:**

6	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE
2	FLUSH BOLTS/SURFACE BOLTS	FB458/SB453-TYPE AS REQ'D - FIELD VERIFY	IVE
1	LOCKSET	MA581L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
2	KICK PLATES	8400 10" X 2" LDW B-CS	IVE
2	OVERHEAD HOLD/STOPS	RE-USE EXISTING	
2	MEETING EDGE SEALS	328AA-S	ZER
1	THRESHOLD	RE-USE EXISTING	
1	GASKETING	8144SBK PSA FRAME HEAD	ZER
1	GASKETING	475AA FRAME JAMBS	ZER
2	DOOR SWEEPS	8198AA	ZER

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

GC TO LUBRICATE EXISTING OVERHEAD HOLD/STOPS USING GLYNN JOHNSON APPROVED MATERIALS. HARDWARE SUPPLIER TO PROVIDE LUBRICATION MATERIALS TO GC.

# HARDWARE SET: 02 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

DO	OR NU	MBER:		
		E1		
EAC	сн то	HAVE:		
	3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE

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1	EXIT DEVICE	25-M-NL-512NL	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A W/SC70A-62A FOR CLEARANCE OF EXIST OVERHEAD HOLDER/STOP TBSRT	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	OVERHEAD HOLD/STOP	RE-USE EXISTING	
1	THRESHOLD	RE-USE EXISTING	
1	GASKETING	8144SBK PSA FRAME HEAD	ZER
1	GASKETING	475AA FRAME JAMBS	ZER
1	DOOR SWEEP	8198AA	ZER
1	LOCK EDGE FILLER	86 EDGE USP	

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

GC TO LUBRICATE EXISTING OVERHEAD HOLD/STOPS USING GLYNN JOHNSON APPROVED MATERIALS. HARDWARE SUPPLIER TO PROVIDE LUBRICATION MATERIALS TO GC.

# HARDWARE SET: 03 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

## **DOOR NUMBER:**

100A 100B			
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## **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA571L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSERS	SC71A SS TB	FAL
1	KICK PLATES	8400 10" X 2" LDW B-CS	IVE
1	THRESHOLD	RE-USE EXISTING	
1	GASKETING	8144SBK PSA FRAME HEAD	ZER
1	GASKETING	475AA FRAME JAMBS	ZER
1	DOOR SWEEPS	8198AA	ZER

REMOVE EXISTING CONCEALED OVERHEAD TRACK HOLDER/STOP.

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 04 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

# **DOOR NUMBER:**

111B 113C	115C	115D		
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# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE
1	EXIT DEVICE	19-R-EO-US32D (EXIT ONLY)	FAL

DOOR HARDWARE 08 71 00 - 7

1	EXIT DEVICE	CD-25-R-512NL-US32D (DOOR 111B, 113C ONLY)	FAL
2	MORTISE CYLINDER	TYPE AS REQ'D (DOOR 111B, 113C ONLY)	
1	SURFACE CLOSER	SC71A SS TB	FAL
1	KICK PLATES	8400 10" X 2" LDW B-CS	IVE
1	THRESHOLD	RE-USE EXISTING	
1	GASKETING	8144SBK PSA HEAD & JAMBS	ZER
1	DOOR SWEEPS	8198AA	ZER

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 05 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

<b>DOOR</b>	<b>NUMBER:</b>
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107

## **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA521L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A SS TB	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	GASKETING	188S-BK	ZER

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 06 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

# **DOOR NUMBER:**

111A

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA571L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A RW/PA TB	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS406/407CVX	IVE
1	MORTISE CYLINDER	TYPE AS REQ'D	

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1	THRESHOLD	545A-244	ZER
1	SWEEP STRIP	8192AA	ZER
1	GASKETING	188S-BK	ZER

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 07 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

#### **DOOR NUMBER:**

101

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA521L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A-H TB	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	FLOOR STOP	FS436	IVE
1	GASKETING	188S-BK	ZER

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 08 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

#### **DOOR NUMBER:**

105 106	 			
	105	106		

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW SIZE AS REQ'D – FIELD VERIFY	IVE
1	PUSH PLATE	8200 8" X 16"	IVE
1	PULL PLATE	8303 8" PULL, 4" X 16" PLATE	IVE
1	SURFACE CLOSER	SC71A RW/PA TB	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS406/407CVX	IVE
1	SILENCERS	SR64	IVE

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

DOOR HARDWARE 08 71 00 - 9

# HARDWARE SET: 09 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

## **DOOR NUMBER:**

108

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW NRP SIZE AS REQ'D – FIELD VERIFY	IVE	
1	EXIT DEVICE	F-25-M-L-DANE-SNB	FAL	
1	MORTISE CYLINDER	TYPE AS REQ'D		
1	SURFACE CLOSER	SC71A FA TB (SS ARM)	FAL	
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE	
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE	
1	GASKET SEAL	188S-BK-PSA	ZER	

PROVIDE FIRE RATED DOOR HARDWARE AT FIRE RATED DOORS. FIELD VERIFY FRAME AND DOOR FOR RATINGS.

WHERE NEW DOOR CLOSER HARDWARE DOES NOT COVER EXISTING HOLE PREPARATIONS, FILL HOLES WITH SEX BOLTS OR OTHER APPROVED FILLER MATERIAL.

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 10 (NEW HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

### **DOOR NUMBER:**

103

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA521L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A RW/PA	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	OVERHEAD STOP	90S SNB	GLY
1	GASKET SEAL	188S-BK-PSA	ZER

ADJUST EXISTING HINGES AND LATCH FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 11 (NEW DOOR X NEW FRAME)

# **DOOR NUMBER:**

102

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1 4.5 X 4.5	IVE
1	LOCKSET	MA521L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A RW/PA	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE

08 71 00 - 10 DOOR HARDWARE

1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS406/407CVX	IVE
1	GASKET SEAL	188S-BK-PSA	ZER

# HARDWARE SET: 12 (EXISTING FRAME X NEW HOLLOW METAL DOOR)

# **DOOR NUMBER:**

100C

## **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA571L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	SURFACE CLOSER	SC71A RW/PA TB	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	FLOOR STOP	FS439	IVE
1	THRESHOLD	545A-224	ZER
1	SWEEP STRIP	8192AA	ZER
1	GASKETING	188S-BK	ZER

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 13 (EXISTING HOLLOW METAL FRAME X EXISTING HOLLOW METAL DOORS)

# DOOR NUMBER:

110

## **EACH TO HAVE:**

3	BUTT HINGES	5BB1/5BB1HW SIZE AS REQ'D – FIELD VERIFY	IVE
1	LOCKSET	MA571L	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS406/407CVX	IVE
1	GASKETING	188S-BK	ZER

ADJUST HINGES AND LATCH FOR PROPER CLOSE AND LATCH OF DOOR.

# HARDWARE SET: 14 (NEW HOLLOW METAL FRAME)

#### DOOR NUMBER:

104 109

CASED OPENING

# **HARDWARE SET: 15**

# **DOOR NUMBER:**

113A	113B	114A	114B	115A	115B

DOOR HARDWARE 08 71 00 - 11

# ALL HARDWARE PROVIDED BY OVERHEAD DOOR SUPPLIER/MFG

# HARDWARE SET: 16 (NEW HOLLOW METAL FRAME X NEW HOLLOW METAL DOORS)

# **DOOR NUMBER:**

CSL-1

# **EACH TO HAVE:**

	,		
6	BUTT HINGES	5BB1HW 4.5 X 4.5	IVE
2	FLUSH BOLTS	FB458	IVE
1	DEADLOCK	D141HD	FAL
1	MORTISE CYLINDER	TYPE AS REQ'D	
2	PUSH PLATE	8200 4" X 16"	IVE
2	PULL PLATE	8303 8" PULL, 4" X 16" PLATE	IVE
2	SURFACE CLOSERS	SC71A SS TB	FAL
2	KICK PLATES	8400 10" X 2" LDW B-CS	IVE
2	MEETING EDGE SEALS	328AA-S	ZER
1	THRESHOLD	655A-V3	ZER
1	GASKETING	8144SBK PSA FRAME HEAD	ZER
1	GASKETING	475AA FRAME JAMBS	ZER
2	DOOR SWEEPS	8198AA	ZER
2	MEETING EDGE SEALS	328AA	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

ADJUST HINGES AND LOCK FOR PROPER CLOSE AND LATCH OF DOOR.

Α.

# HARDWARE SET: 17 (NEW HOLLOW METAL FRAME X NEW HOLLOW METAL DOOR)

# **DOOR NUMBER:**

MSB-1

# **EACH TO HAVE:**

3	BUTT HINGES	5BB1 4.5 X 4.5	IVE
1	LOCKSET	MA581L	FAL
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	THRESHOLD	655A-V3	ZER
1	WEATHERSTRIP	475AA	ZER
1	DOOR SWEEP	8192AA	ZER
1	DOOR BOTTOM DRIP	11A	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

# **END OF SECTION**

08 71 00 - 12 DOOR HARDWARE

# SECTION 08 80 00 GLAZING

## **PART 1 GENERAL**

# 1.01 SECTION INCLUDES

- A. Plastic sheet glazing units.
- B. Glazing accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 01 73 29 - Cutting and Patching.

## 1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data on Plastic Sheet Glazing Units: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Samples: Submit two samples 12 by 12 inch in size of plastic units, showing design.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 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 and with at least three years documented experience.

# 1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

# 1.07 WARRANTY

A. Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty, starting on the date of Final Acceptance of the Project, to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

# **PART 2 PRODUCTS**

# 2.01 PLASTIC SHEET GLAZING MANUFACTURERS:

- A. Basis of Design: Palram; SUNTUF or SUNSKY Corrugated Polycarbonate Sheet: www.palram.com; or approved equivalent.
- B. Substitutions: See Section 01 60 00 Product Requirements.

#### 2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
  - 1. Design Pressure: Calculated in accordance with ASCE 7 and applicable codes.

### 2.03 PLASTIC SHEET GLAZING UNITS

A. Corrugated Polycarbonate Sheet: Weather and ultraviolet (UV) protected.

GLAZING 08 80 00 - 1

- 1. Application: Locations as indicated on drawings.
- 2. Tint: Clear, transparent.
- 3. Surface Finish: Smooth.
- 4. Thickness: 0.031 to 0.059 inch.
- 5. Light Transmittance (LT): 90 percent, nominal.
- 6. Glazing Method: As required for application indicated on drawings.
- 7. Manufacturers:
  - a. Palram; SUNTUF or SUNSKY panels as required to match profile of existing panels to be replaced: www.palram.com; or approved equivalent.
  - b. Substitutions: See Section 01 60 00 Product Requirements.

## **PART 3 EXECUTION**

#### 3.01 PREPARATION

- A. Clean contact surfaces with appropriate cleaner and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

# 3.02 INSTALLATION, GENERAL

- A. Install polycarbonate glazing in compliance with written instructions of manufacturer.
- B. Install horizontal and vertical closures conforming to profile of polycarbonate panels.
- C. Use EPDM-washered fasteners to attach polycarbonate panels to structure.
- D. Seal joints and perimeter as recommended by polycarbonate manufacturer.

## 3.03 CLEANING

- A. Remove nonpermanent labels immediately after glazing installation is complete.
- B. Clean polycarbonate glazing and adjacent surfaces after sealants are fully cured.

## **END OF SECTION**

08 80 00 - 2 GLAZING

# SECTION 08 87 33 DECORATIVE FILMS

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Glazing film applied to existing glazing assemblies.
  - 1. Location: Lite in existing Locker Room door.

#### 1.02 REFERENCE STANDARDS

 A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.

#### 1.03 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.
- D. Specimen Warranty.

#### 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of glazing films with minimum 10 years successful experience.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

#### 1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.07 WARRANTY

A. Provide 15 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration. Warranty shall start on the date of Final Acceptance of the Project.

# **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. 3M Company: www.3MArchitecturalMarkets.com.
- B. Flexvue Films: www.flexvuefilms.com.
- C. Kuraray America, Inc: www.kuraray.us.com.
- D. Madico, Inc: www.madico.com.

# 2.02 MATERIALS

- A. Glazing Film: Frosted PVC film for bonding to glass.
  - 1. Thickness: 4.7 mil.
  - 2. Color Family: White.
  - 3. Design Pattern: Frosted.
  - 4. Adhesive Type: Pressure-sensitive acrylic, permanent.
  - 5. Application Method: Wet.

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- 6. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
- 7. Light Transmission of Film Applied on 1/4 inch Thick Clear Annealed Glass:
  - a. Visible Light Transmittance: 72 percent maximum.
- 8. Manufacturer/Product: 3M Company; 3M Crystal Glass Finishes 7725SE-324, Frosted Crystal, or approved equivalent.
- B. Accessory Materials: As recommended or required by film manufacturer.
- C. Glass Cleaner: As recommended by glazing film manufacturer.

#### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Field-Applied Film: Verify that existing conditions are adequate for proper application and performance of film.
- B. Verify glass is not cracked, chipped, broken, or damaged.
- C. Verify that frames are securely anchored and free of defects.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.02 PREPARATION

- A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
- B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
- C. Protect adjacent surfaces.
- D. Do not begin installation until substrates have been properly prepared.

#### 3.03 INSTALLATION

- A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.
- B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.
- C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.
- D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.
- E. Clean installed film in accordance with manufacturer's written recommendations.

# 3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

# **END OF SECTION**

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# SECTION 09 21 16 GYPSUM BOARD ASSEMBLIES

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud interior wall framing.
- C. Metal grid ceiling framing.
- D. Gypsum wallboard of the following types:
  - 1. Mold and moisture-resistant, paper-faced.
- E. Mineral fiber batt insulation used as acoustical insulation in interior walls.
- F. Acoustic sealant.
- G. Joint treatment and accessories.

#### 1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 Cold Formed Metal Framing: Metal stud framing heavier than 20 gage.
- B. Section 06 10 00 Rough Carpentry: Wood blocking product and execution requirements.
- Section 07 84 00 Firestopping: Top-of-wall and wall-penetration assemblies at fire rated walls.
- D. Section 07 92 00 Joint Sealants: Sealing acoustical gaps in construction other than gypsum board work.
- E. Section 09 91 23 Interior Painting.

#### 1.03 REFERENCE STANDARDS

- A. AISI S100 North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2018).
- B. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- D. ASTM C645 Standard Specification for Nonstructural Steel Framing Members 2018.
- E. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- F. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- G. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board 2020.
- H. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.
- I. ASTM C1047 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- J. ASTM C1396/C1396M Standard Specification for Gypsum Board 2017.
- K. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- L. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- M. ASTM E413 Classification for Rating Sound Insulation 2022.
- N. GA-216 Application and Finishing of Gypsum Panel Products 2021.

- O. GA-226 Application of Gypsum Board to Form Curved Surfaces 2019.
- P. UL (FRD) Fire Resistance Directory Current Edition.

## 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on metal framing, moisture and mold-resistant gypsum board, mineral fiber acoustical insulation, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

## 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

## **PART 2 PRODUCTS**

### 2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - See PART 3 for finishing requirements.
- B. Typical Interior Partitions: Unless otherwise indicated, provide completed assemblies with the following characteristics:
  - 1. Acoustic Attenuation: STC of 47, minimum, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
    - a. All interior partitions shall have 3-1/2 inches, minimum, of mineral wool batt insulation, fastened to prevent sliding down and leaving void at the top.
- C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
  - UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

### 2.02 METAL FRAMING MATERIALS

- A. Manufacturers Metal Framing, Connectors, and Accessories:
  - 1. ClarkDietrich: www.clarkdietrich.com.
  - 2. MarinoWARE: www.marinoware.com.
  - 3. Phillips Manufacturing Co: www.phillipsmfg.com.
  - 4. The Steel Network, Inc: www.SteelNetwork.com.
  - 5. Super Stud Building Products, Inc: www.buysuperstud.com.
  - 6. Telling Industries: www.tellingindustries.com.
- B. Non-Structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing as follows:
  - 1. Maximum Deflection:
    - a. Typical Drywall Partitions: L/240 at 5 psf, unless otherwise indicated.
      - 1) All interior metal studs shall be minimum **20 gage (30 mils)**, **3-5/8 inches deep**, **with 1-5/8 inch flanges**, unless otherwise indicated.
  - 2. Studs: "C" shaped with knurled or emobossed faces, and minimum 1.625-inch flanges with flange return lips.
    - a. Provide 20 gage (30 mils) or heavier studs at all locations. Do not use any 22 or 25 gage studs.
      - 1) Studs heavier than 20 gage are specified in Section 05 40 00.
  - 3. Runners: U shaped, sized to match studs.
  - 4. Ceiling Channels: C-shaped.
  - 5. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing 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.
  - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
  - 4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
    - a. Products:
      - Basis of Design: The Steel Network, Inc; Product "VertiClip": www.steelnetwork.com.
      - 2) Simpson Strong-Tie Company, Inc; Product "SCW Head-of-Wall Slide-Clip Connector": www.strongtie.com.
  - 5. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
- D. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
  - Products:
    - a. Armstrong; Drywall Grid System: www.armstrongceilings.com.
    - b. USG Corporation; Drywall Suspension System: www.usg.com.

## 2.03 BOARD MATERIALS

- A. Manufacturers Gypsum-Based Board:
  - 1. American Gypsum Company: www.americangypsum.com.
  - 2. CertainTeed Corporation: www.certainteed.com.
  - 3. Georgia-Pacific Gypsum: www.gpgypsum.com.
  - 4. National Gypsum Company: www.nationalgypsum.com.
  - 5. USG Corporation: www.usg.com.
- B. Country of Origin: All gypsum wallboard materials shall be quarried or reclaimed from sources within the United States and processed/manufactured within the United States.
- C. Recycled Content: All gypsum wallboard shall contain minimum 5% total recycled content.
- D. General Application Requirements:
  - 1. Paper-faced, mold and moisture-resistant gypsum board panels shall be used for interior vertical surfaces and ceilings, unless otherwise indicated.
- E. 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 interior vertical surfaces and ceilings, unless otherwise indicated.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold-resistant board is required at all locations.
  - 3. Thickness:
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 5/8 inch.
    - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
  - 4. Mold-Resistant Paper Faced Products: Type X, with moisture and mold-resistant core and surfaces.
    - a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com.
    - b. CertainTeed Corp; M2Tech Type X Gypsum Board.
    - Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.

- d. National Gypsum Company; Gold Bond XP Gypsum Board: www.nationalgypsum.com.
- e. USG Corp; USG Sheetrock Brand Mold Tough Panels Firecode X.

#### 2.04 GYPSUM WALLBOARD ACCESSORIES

- A. Mineral Fiber Acoustic Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced.
  - 1. Flame Spread Index: 0 (zero), when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
  - 3. Thickness: 3-1/2 inches, unless greater thickness indicated.
  - 4. Recycled Content: Minimum 50% total recycled content.
  - Manufacturer:
    - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com.
    - b. Thermafiber, Inc; SAFB: www.thermafiber.com.
    - c. ROCKWOOL (ROXUL, Inc); AFB™: www.rockwool.com.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
  - 1. Products: Provide one of the following:
    - a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com.
    - Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com.
    - c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com.
- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated, with either knurled and perforated or expanded flanges, and beaded for concealment of flanges in joint compound.
  - Types: Provide corner beads, L-type edge-trim beads, LC-type edge-trim beads, and one-piece control joint beads.
  - 2. Special Shapes: In addition to conventional corner bead and control joints, provide Ubead at exposed panel edges.
  - 3. Products:
    - a. Same manufacturer as framing materials.
    - b. Phillips Manufacturing Co: www.phillipsmfg.com.
    - c. Trim-tex. Inc: www.trim-tex.com.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  - 1. Paper Tape: 2 inch wide, creased paper tape for joints and corners,.
    - a. Product: Equivalent to USG Sheetrock Brand Joint Paper Tape.
  - 2. Joint Compound: Setting type, field-mixed, for use at all locations.
    - a. Product: Equivalent to USG Sheetrock Brand "Durabond" or "Easy Sand" Joint Compounds.
- E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- F. Anchorage to Substrate: Tie wire, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- G. Insulation Fasteners: Impaling clip of galvanized steel, plastic or nylon, with washer retainer, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

# **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 C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 24 inches on center.
  - 1. Level ceiling systems to a tolerance of 1/600.
  - 2. Laterally brace entire suspension system.
  - 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
  - 1. Extend partition framing to structure at all locations, except where otherwise indicated.
  - 2. 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. Blocking: Install wood blocking as specified in Section 06 10 00 for support of:
  - 1. Framed openings.
  - 2. Wall-mounted cabinets.
  - 3. Plumbing fixtures.
  - 4. Toilet partitions.
  - 5. Toilet accessories.
  - 6. Wall-mounted door hardware.

# 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.
  - 1. All interior partitions shall have **3-1/2 inches**, minimum, of mineral wool batt insulation, fastened to prevent sliding down and leaving void at the top. Provide additional thicknesses as required to completely fill stud cavities.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
  - Place one bead continuously on substrate before installation of perimeter framing members.
  - 2. Place continuous bead at perimeter of each layer of gypsum board.
  - 3. 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. Single-Layer Non-Rated: Install gypsum board of type indicated in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: Use moisture and mold-resistant 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.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board.
- F. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.
- G. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

#### 3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints at locations indicated, or if not indicated, consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound.
  - 1. Install "L" bead where work is tightly abutted to other construction.
  - Install "LC" bead where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
  - 3. Semi-finishing edge trim will not be allowed.

# 3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with setting type joint compound and finish with setting type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 2: Behind fixed cabinetry, and on backing board to receive tile finish.
  - 3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- 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.
- D. Priming and painting of finished surfaces is specified in Section 09 91 23.

# 3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

# **END OF SECTION**

# SECTION 09 51 00 ACOUSTICAL CEILINGS

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

### 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 02 41 16 Selective Building Demolition.

#### 1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- B. ASTM C635/C635M Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
- C. ASTM C636/C636M Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- D. ASTM E580/E580M Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2022.
- E. ASTM E1264 Standard Classification for Acoustical Ceiling Products 2022.

## 1.04 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.

# 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples at least 4 by 8 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

#### 1.06 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.

### 1.07 EXTRA MATERIALS

A. Provide 100 sq ft of each type of acoustical unit for Owner's use in maintenance of building.

#### 1.08 WARRANTY

A. Acoustical Panels: Provide manufacturer's 30-year system warranty against visible sag, mold and mildew. Warranty shall start on the date of Final Acceptance of the Project.

# **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc: www.armstrongceilings.com.

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- 2. CertainTeed Corporation: www.certainteed.com.
- 3. USG Corporation: www.usg.com/ceilings.
- B. Suspension Systems:
  - 1. Same as for acoustical units.

#### 2.02 ACOUSTICAL UNITS

- A. Acoustical Units General: ASTM E1264, Class A.
- B. Acoustical Panels, Type ACT-1: Mineral fiber with membrane-faced overlay, with the following characteristics:
  - Classification: ASTM E1264 Type IV.
    - a. Form: 2, water felted.
    - b. Pattern: "E" lightly textured.
    - c. Fire Class A.
  - 2. Size: 24 by 24 inches.
  - 3. Thickness: 7/8 inches.
  - 4. Light Reflectance: 87 percent, determined in accordance with ASTM E1264.
  - 5. NRC: 0.80, determined as specified in ASTM E1264.
  - 6. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
  - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 8. Panel Edge: Square.
  - 9. Humidity Resistance: Provide sag-resistant panels recommended by manufacturer for installation before HVAC systems are operating.
  - 10. Anti-Microbial Protection: Provide special paint on face and back of panels to inhibit or retard surface growth of mold/mildew on painted surfaces.
  - 11. Color: White.
  - 12. Suspension System Type ES-1: Exposed grid.
  - 13. Products:
    - a. Armstrong World Industries, Inc; Ultima High NRC No. 1940: www.armstrongceilings.com; or approved equivalent.
- C. Acoustical Panels, Type ACT-2: Mineral fiber with washable finish, with the following characteristics:
  - Classification: ASTM E1264 Type IV.
    - a. Form: 2, water felted.
    - b. Pattern: "E" lightly textured.
    - c. Fire Class A.
  - 2. Size: 24 by 24 inches.
  - 3. Thickness: 7/8 inches.
  - Light Reflectance: 86 percent, determined in accordance with ASTM E1264.
  - 5. NRC Range: 0.80, determined in accordance with ASTM E1264.
  - 6. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
  - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 8. Panel Edge: Square.
  - 9. Humidity Resistance: Provide sag-resistant panels recommended by manufacturer for installation before HVAC systems are operating.
  - 10. Anti-Microbial Protection: Provide special paint on face and back of panels to inhibit or retard surface growth of mold/mildew on painted surfaces.
  - 11. Color: White.
  - 12. Suspension System Type ES-1: Exposed grid.
  - 13. Products:
    - a. Armstrong World Industries, Inc; Ultima Health Zone High NRC No. 1445: www.armstrongceilings.com; or approved equivalent.

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# 2.03 SUSPENSION SYSTEM(S)

- A. 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:
    - Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System, Type ES-1: Hot-dipped galvanized steel grid and cap.
  - 1. Application(s): For use with ACT-1.
  - Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  - 3. Profile: Tee: 15/16 inch face width.
  - 4. Finish: Baked enamel.
  - 5. Products:
    - a. Armstrong World Industries, Inc; Prelude XL: www.armstrongceilings.com; or approved equivalent.
- C. Exposed Suspension System, Type ES-2: Minimum G60 hot-dipped galvanized steel grid with prefinished aluminum cap.
  - 1. Application(s): For use with ACT-2.
  - 2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
  - 3. Profile: Tee; 15/16 inch face width.
  - 4. Finish: Baked enamel.
  - 5. Products:
    - a. Armstrong World Industries, Inc; Prelude Plus XL Fire Guard: www.armstrongceilings.com; or approved equivalent.

#### 2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application 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. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
  - 2. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

# **PART 3 EXECUTION**

## 3.01 EXAMINATION

- 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. Locate system on room axis according to reflected plan.

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- Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Install in bed of acoustical sealant.
  - 2. Use longest practical lengths.
  - 3. Overlap and rivet corners.
- E. 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.
- 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. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges.
  - 3. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Install hold-down clips on panels within 10 ft of an exterior door.

# 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.

# **END OF SECTION**

09 51 00 - 4 ACOUSTICAL CEILINGS

# SECTION 09 65 00 RESILIENT FLOORING

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 02 41 16 Selective Building Demolition.

#### 1.03 REFERENCE STANDARDS

- A. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
- B. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.
- ASTM F1066 Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2018).
- D. ASTM F1861 Standard Specification for Resilient Wall Base 2021.
- E. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.
- F. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.
- G. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2023.

### 1.04 SUBMITTALS

- A. See Section 01 33 00 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. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Verification Samples: Submit two samples, full 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. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning flooring.

## 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

## 1.06 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.

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- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 65 degrees F and 85 degrees F.
- D. Protect roll materials from damage by storing on end.

#### 1.07 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 65 degrees F and below 85 degrees F.

# 1.08 WARRANTY

- A. Provide manufacturer's standard Commercial Floors Limited Warranty for the following terms:
  - 1. VCT: Five (5) Years, starting on the date of Final Acceptance of the Project.

#### **PART 2 PRODUCTS**

## 2.01 TILE FLOORING

- A. Vinyl Composition Tile Type VCT-1: Homogeneous, with color extending throughout thickness.
  - 1. Manufacturers:
    - a. Basis of Design: Armstrong Flooring, Inc; Standard Execelon Imperial Texture: www.armstrongflooring.com.
    - b. Johnsonite, a Tarkett Company: www.johnsonite.com.
    - c. Substitutions: See Section 01 60 00 Product Requirements.
  - Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
  - 4. Size: 12 by 12 inch.
  - 5. Thickness: 0.125 inch.
  - 6. Pattern: Marbleized.
  - 7. Color: To be selected by Architect from manufacturer's full range.

# 2.02 RESILIENT BASE

- A. Resilient Base Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; Style B, Cove.
  - 1. Manufacturers:
    - a. Basis of Design: Roppe Corporation; "Pinnacle": www.roppe.com.
    - b. Flexco; "Wallflowers": www.flexcofloors.com.
    - c. Johnsonite, a Tarkett Company; "BaseWorks": www.johnsonite.com.
    - d. Mannington Mills, Inc; "Optimum Edge": www.mannington.com.
  - Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
  - 3. Height: 6 inch.
  - 4. Thickness: 0.125 inch.
  - 5. Finish: Matte.
  - 6. Length: Roll.
  - 7. Color: To be selected by Architect from manufacturer's full range.
  - Accessories: Premolded external corners and internal corners.

# 2.03 ACCESSORIES

- A. Subfloor Filler: Type recommended by flooring manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
- D. Filler for Coved Base: Plastic.

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E. Floor Cleaners, Sealers and Polishes: 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.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test as Follows:
    - a. Alkalinity (pH): ASTM F710.
    - b. Internal Relative Humidity: ASTM F2170.
    - Moisture Vapor Emission: ASTM F1869.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

# 3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.
- E. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

# 3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install resilient flooring items and accessories in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Flooring 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.
  - 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.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.
- I. Install feature strips where indicated.

# 3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

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C. Install square tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

## 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, use premolded units. At exposed ends, use premolded units.
- 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, seal and polish (2 coats) in accordance with manufacturer's written instructions.

## 3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

## **END OF SECTION**

09 65 00 - 4 RESILIENT FLOORING

# SECTION 09 91 13 EXTERIOR PAINTING

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - Exposed steel surfaces.
  - 2. Hollow metal doors and frames.
  - 3. Bollards.
- 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, and operating parts of equipment.
  - 5. Non-metallic roofing and flashing.
  - 6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
  - 7. Floors, unless specifically indicated.
  - 8. Cast stone.
  - 9. Exterior insulation and finish system (EIFS).
  - 10. Glass.
  - 11. Concrete masonry units
  - 12. Concealed pipes, ducts, and conduits.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 05 50 00 Metal Fabrications: Shop-primed items.
- C. Section 08 11 13 Hollow Metal Doors and Frames: Shop-primed items
- D. Section 09 91 23 Interior Painting.

## 1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

#### 1.04 REFERENCE STANDARDS

- A. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. SSPC-SP 1 Solvent Cleaning 2015, with Editorial Revision (2016).
- C. SSPC-SP 2 Hand Tool Cleaning 2018.

# 1.05 SUBMITTALS

- A. See Section 01 33 00 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. Manufacturer's installation instructions.
  - 3. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

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- Samples: Submit two sets of paper chip samples illustrating range of colors available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- E. Maintenance Data: Submit data 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.

# 1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

# 1.07 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.

# 1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles 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. Provide paints and finishes from the same manufacturer to the greatest extent possible.
  - 1. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

#### C. Paints:

- 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
- 2. Benjamin Moore & Co: www.benjaminmoore.com.
- 3. PPG Paints: www.ppgpaints.com.
- D. Primer Sealers: Same manufacturer as top coats.

# 2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required 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.

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- 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 described explicitly in manufacturer's product instructions.
- B. Flammability: Comply with applicable code for surface burning characteristics.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Owner from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.

#### 2.03 PAINT SYSTEMS - EXTERIOR

- A. Ferrous Metals, Primed: Opaque, 100% Acrylic.
  - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
  - Semi-Gloss: Two coats of Sherwin-Williams DTM Acrylic Coating, applied to achieve a dry-film thickness (DFT) of 2.5 - 4.0 mils per coat.
- B. Galvanized Metals and Aluminum: Opaque, 100% Acrylic:
  - 1. Semi-Gloss: Two coats of Sherwin-Williams DTM Acrylic Coating," B66-200 Series, applied to achieve a dry-film thickness (DFT) of 2.5 4.0 mils per coat.

#### 2.04 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 properly 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 effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

# 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 repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- H. Galvanized Surfaces:
  - Remove surface contamination and oils and wash with solvent according to SSPC-SP
     1.

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- 2. Prepare surface according to SSPC-SP 2.
- Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 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.
- J. 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.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. 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 after Substantial Completion.

**END OF SECTION** 

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## SECTION 09 91 23 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 or unless otherwise indicated .
  - Work includes striping of concrete floors to designate boundaries or aisles, as indicated on drawings.
  - 2. Work includes cleaning and painting of steel structure in Shop.
- 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. Porcelain and other tiles.
  - 8. Glass.
  - 9. Acoustical materials, unless specifically indicated.
  - 10. Concealed pipes, ducts, and conduits.

# 1.02 RELATED REQUIREMENTS

- A. Section 01 73 29 Cutting and Patching.
- B. Section 03 01 00 Maintenance of Concrete.
- C. Section 04 29 00 Engineered Unit Masonry.
- D. Section 05 50 00 Metal Fabrications: Shop-primed items.
- E. Section 08 11 13 Hollow Metal Doors and Frames: Shop-primed items.
- F. Section 09 91 13 Exterior Painting.

## 1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

### 1.04 REFERENCE STANDARDS

- ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D4258 Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).
- C. ASTM D4442 Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- D. SSPC-SP 1 Solvent Cleaning 2015, with Editorial Revision (2016).
- E. SSPC-SP 13 Surface Preparation of Concrete 2018.

## 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:

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- 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
- 2. Manufacturer's installation instructions.
- 3. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit two sets of paper chip samples illustrating range of colors available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- E. Maintenance Data: Submit data 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.

#### 1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

# 1.07 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.

#### 1.08 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. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

# **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
  - 1. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
- B Paints
  - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
  - 2. Benjamin Moore & Co: www.benjaminmoore.com.
  - 3. PPG Paints: www.ppgpaints.com.
- 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.
  - 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.

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- 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. Flammability: Comply with applicable code for surface burning characteristics.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Owner from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.

#### 2.03 PAINT SYSTEMS - INTERIOR

- A. Concrete Floors (Aisle Marking Paint): Opaque, Acrylic, Yellow Color, 4-Inch Striping:
  - 1. Gloss: One coat of Sherwin-Williams SetFast Acrylic Aisle Marking Paint TM2173 Yellow, applied at approximately 15 mils wet thickness, resulting in 6.2 mils dry-film thickness (DFT).
- B. Concrete Masonry Unit (CMU) Surfaces: Opaque, 100% Acrylic:
  - 1. Primer: One coat of block filler; Sherwin-Williams ConFlex Block Filler.
    - a. Note: Block filler may be omitted at previously painted CMU.
  - 2. Eggshell: Two coats of Sherwin-Williams Harmony Zero VOC Interior Latex, applied to achieve a dry-film thickness (DFT) of 1.7 mils per coat.
- C. Ferrous, Galvanized, and Aluminum Metals: Opaque, 100% Acrylic:
  - 1. Primer: Sherwin-Williams Pro Industrial Pro-Cryl Universal Metal Primer.
    - Note: Touch-up shop primer with rust-inhibitive primer recommended by top coat manufacturer.
  - 2. Semi-Gloss: Two coats of Sherwin-Williams Pro Industrial High Performance Acrylic, applied to achieve a dry-film thickness (DFT) of 2.5 4.0 mils per coat.
- D. Wood: Opaque, 100% Acrylic:
  - 1. One coat of latex primer sealer; Sherwin-Williams Premium Wall and Wood Latex Primer.
  - 2. Semi-Gloss: Two coats of Sherwin-Williams Harmony Zero VOC Interior Latex, applied to achieve a dry-film thickness (DFT) of 1.7 mils per coat.
    - a. Note: All six sides of each plywood wainscot panel shall be painted.
- E. Mold and Moisture-Resistant Gypsum Board: Opaque, 100% Acrylic:
  - 1. One coat of primer; Sherwin-Williams Premium Wall and Wood Interior Latex Primer.
  - Eggshell (at all locations except where Gloss finish is indicated): Two coats of Sherwin-Williams Harmony Zero VOC Interior Latex, applied to achieve a dry-film thickness (DFT) of 1.7 mils per coat.
  - Gloss (at Shower ceilings): Two coats of Sherwin Williams ProClassic Waterborne Interior Acrylic Enamel, applied to achieve a dry-film thickness (DFT) of 1.5 mils per coat.
- F. Fire-Retardant Coating for Plywood Backboards: Intumescent:
  - 1. One coat of fire-retardant primer sealer.
  - 2. Gloss: Two coats of intumescent coating, maximum flame/smoke rating of 25/50.

# 2.04 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.

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#### 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. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. 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 repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

## G. 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 concrete according to ASTM D4258. Allow to dry.
- 3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

## H. Masonry:

- Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
- 2. Prepare surface as recommended by top coat manufacturer.
- I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- K. Galvanized Surfaces:
  - Remove surface contamination and oils and wash with solvent according to SSPC-SP
     1.
  - 2. Prepare surface according to SSPC-SP 2.
- L. Ferrous Metal:
  - Solvent clean according to SSPC-SP 1.

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- 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.
- M. 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.
- N. 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.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. 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 after Substantial Completion.

**END OF SECTION** 

INTERIOR PAINTING 09 91 23 - 5

## SECTION 10 11 00 VISUAL DISPLAY UNITS

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

- A. Porcelain enamel steel markerboards.
- B. Tackboards.

## 1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

## 1.03 REFERENCE STANDARDS

- A. ANSI A135.4 Basic Hardboard 2012 (Reaffirmed 2020).
- B. ASTM A424/A424M Standard Specification for Steel, Sheet, for Porcelain Enameling 2018.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- D. PS 1 Structural Plywood 2009 (Revised 2019).

## 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, tackboard, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Samples: Color charts for selection of color and texture of porcelain enamel steel markerboard, tackboard, and trim.
- E. Manufacturer's printed installation instructions.
- F. Manufacturer's Qualification Statement.

# 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### 1.06 WARRANTY

A. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining. Warranty shall start on the date of Final Acceptance of the Project.

## **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. ADP Lemco, Inc: www.adplemco.com.
- B. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
- C. MooreCo, Inc: www.moorecoinc.com.

## 2.02 VISUAL DISPLAY UNITS

- A. Porcelain Enamel Steel Markerboards:
  - 1. Color: White.
  - 2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch.
  - 3. Core: Plywood, manufacturer's standard thickness, laminated to face sheet.
  - 4. Backing: Aluminum foil, laminated to core.
  - 5. Size: As indicated on drawings.
  - 6. Frame: Extruded aluminum, with concealed fasteners.
  - 7. Frame Finish: Anodized, natural.
  - 8. Accessories: Provide marker tray and map rail.

VISUAL DISPLAY UNITS 10 11 00 - 1

- B. Tackboards: Composition cork.
  - 1. Cork Thickness: 1/4 inch.
  - 2. Color: As selected from manufacturer's full range.
  - 3. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
  - 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
  - 5. Size: As indicated on drawings.
  - 6. Frame: Extruded aluminum, with concealed fasteners.
  - 7. Frame Profile: Manufacturer's standard.
  - 8. Frame Finish: Anodized, natural.

#### 2.03 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Plywood: PS 1 Grade C-D, softwood.
- C. Hardboard for Cores: ANSI A135.4, Class 1 Tempered, S2S (smooth two sides).
- D. Foil Backing: Aluminum foil sheet, 0.015 inch thick.
- E. Adhesives: Type used by manufacturer.

#### 2.04 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. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
  - 1. Provide a minimum of one map hook for every two feet of map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Cleaning Instruction Plate: Provide instructions for markerboard cleaning on a metal plate fastened to perimeter frame near marker rail.
- E. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.
- F. 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 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of marker tray at 30 inches above finished floor.
- C. Secure units level and plumb.

# 3.03 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 Substantial Completion.

# **END OF SECTION**

## SECTION 10 14 00 SIGNAGE

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Room and door signs.

#### 1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards 2010 ADA Standards for Accessible Design 2010.
- C. ICC A117.1 Accessible and Usable Buildings and Facilities 2017.

## 1.03 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
  - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

## 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Store tape adhesive at normal room temperature.

## **PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

- A. Flat Signs:
  - 1. Best Sign Systems, Inc: www.bestsigns.com.
  - 2. Inpro: www.inprocorp.comle.
  - 3. Mohawk Sign Systems, Inc: www.mohawksign.com.

# 2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

SIGNAGE 10 14 00 - 1

- B. Room and Door Signs:
  - 1. Sign Type: Flat signs with injection molded panel media as specified.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  - 3. Sign Sizes: As indicated on drawings.
  - 4. Character Height: As indicated on drawings.
  - 5. Office and Other Room Doors: Identify with the room names and numbers indicated on drawings; in addition, provide one or two "window" sections as indicated on drawings.
  - 6. Rest Rooms: Identify with pictograms, the names "MALE LATRINE" and "FEMALE LATRINE", and braille.

#### 2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
  - 1. Edges: Square.
  - 2. Corners: Square.
  - 3. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, non-glare on front.
  - 4. Wall Mounting of One-Sided Signs:
    - a. Interior: Tape adhesive.
    - b. Exterior: 4 screws in predrilled countersunk mounting holes.
- B. Color and Font: Unless otherwise indicated:
  - 1. Character Font: Helvetica, Arial, or other sans serif font.
  - 2. Character Case: Upper case only.
  - 3. Background Color: As selected by Architect or Owner.
  - 4. Character Color: Contrasting color as selected by Architect or Owner.

#### 2.04 TACTILE SIGNAGE MEDIA

- A. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
  - 1. Total Thickness: 1/8 inch.

## 2.05 ACCESSORIES

- A. Exposed Screws: Chrome plated.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

#### PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

## 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

## **END OF SECTION**

10 14 00 - 2 SIGNAGE

# SECTION 10 21 13.19 PLASTIC TOILET COMPARTMENTS

## **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

## 1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry: Blocking and supports.
- B. Section 10 28 00 Toilet Accessories.

## 1.03 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

# **PART 2 PRODUCTS**

# 2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
  - 1. Basis of Design: Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com.
  - 2. All American Metal Corp AAMCO: www.allamericanmetal.com.
  - 3. Inpro: www.inprocorp.com.
  - 4. Metpar Corp: www.metpar.com.
  - 5. Partition Systems International of South Carolina: www.psisc.com.

### 2.02 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286: floor-mounted headrail-braced.
  - 1. Color: Single color as selected.
  - 2. Doors:
    - a. Thickness: 1 inch.
    - b. Width: 24 inch.
    - c. Width for Handicapped Use: 36 inch, out-swinging.
    - d. Height: 55 inch.
  - 3. Panels:
    - a. Thickness: 1 inch.
    - b. Height: 55 inch.
    - c. Depth: As indicated on drawings.
  - 4. Pilasters:
    - a. Thickness: 1 inch.

- b. Width: As required to fit space; minimum 3 inch.
- c. Height: 82 inch.
- Screens: Without doors; to match compartments; mounted to wall with continuous wall brackets.

## 2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile, clear anodized.
  - Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Anodized aluminum; continuous type; clear anodized.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  - For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hinges: Integral type, fabricated in the door and pilaster with no exterior exposed metal parts.
  - 1. Hinges shall operate with field-adjustable nylon cams that can be field adjusted to any angle.
- F. Door Hardware: Anodized aluminum, manufacturer's standard finish.
  - Door Latch: Slide type.
  - Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
  - 3. Provide door pull for outswinging doors.
- G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

#### PART 3 EXECUTION

## 3.01 EXAMINATION

- Verify that field measurements are as indicated on shop drawings.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

# 3.02 INSTALLATION

- Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

## 3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

## 3.04 ADJUSTING

10 21 13.19 - 2

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return outswinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

#### **END OF SECTION**

# SECTION 10 28 00 TOILET ACCESSORIES

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

Commercial toilet accessories.

#### 1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry: Concealed blocking for support of accessories.
- B. Section 10 21 13.19 Plastic Toilet Compartments.

## 1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design 2010.
- B. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- C. ASTM A269/A269M Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2015a (Reapproved 2019).
- D. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- E. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- F. ASTM B456 Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium 2017.
- G. ASTM C1036 Standard Specification for Flat Glass 2021.
- H. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

## 1.05 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
  - 1. American Specialties, Inc: www.americanspecialties.com.
  - 2. Bobrick Washroom Equipment, Inc: www.bobrick.com.
  - 3. Bradley Corporation: www.bradleycorp.com.
- B. Provide products of each category type by single manufacturer.
- C. Refer to Plans and Toilet Accessories Schedules for accessory locations.

## 2.02 MATERIALS

- A. Accessories General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

TOILET ACCESSORIES 10 28 00 - 1

- B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- G. Adhesive: Two component epoxy type, waterproof.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

## 2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.
- E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
- F. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- G. Back paint components where contact is made with building finishes to prevent electrolysis.

## **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06 10 00 for installation of blocking in walls.

### 3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

#### 3.03 INSTALLATION

- Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

## 3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

#### 3.05 SCHEDULE

A. Refer to Toilet Accessories Schedule on Drawings.

#### **END OF SECTION**

10 28 00 - 2 TOILET ACCESSORIES

# **SECTION 10 51 13 METAL LOCKERS**

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

A. Metal lockers.

#### 1.02 RELATED REQUIREMENTS

A. Section 10 51 53 - Locker Room Benches.

#### 1.03 REFERENCE STANDARDS

#### 1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- Samples: Submit two samples 3 by 5 inches in size showing color and finish of metal locker material.
- E. Manufacturer's Installation Instructions: Indicate component installation assembly.

# 1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Metal Lockers:
  - 1. Basis of Design: Art Metal Products; AMP 1005 Bulldog Corridor Lockers: www.artmetalproducts.com.
  - 2. List Industries, Inc: www.listindustries.com.
  - 3. Lyon Workspace Products: www.lyonworkspace.com.
  - 4. Penco Products, Inc: www.pencoproducts.com.
  - 5. Republic Storage Systems Co: www.republicstorage.com.
  - 6. WEC Manufacturing: www.itswec.com.

# 2.02 LOCKER APPLICATIONS

- A. Wardrobe Lockers: Metal lockers, wall mounted for base indicated on drawings.
  - 1. Width: 12 inches.
  - 2. Depth: 16 inches.
  - Height: 72 inches.
  - 4. Configuration: Single tier.
  - 5. Fittings:
    - a. Hat shelf.
    - b. Hooks: Two single prong wall hooks and one double prong ceiling hook.
  - 6. Ventilation: Louvers at top and bottom of door panel.
  - 7. Locking: Padlock hasps, for padlocks provided by Owner.
    - a. Locking Action: Positive, automatic type, whereby locker may be locked when open, then closed without unlocking.
  - 8. Color: To be selected from manufacturer's full range.

## 2.03 METAL LOCKERS

- A. Locker Case Construction:
  - Heavy-Duty, Welded Construction: Made of formed and welded together sheet steel; metal edges finished smooth without burrs; baked enamel or powder coat finished inside and out.

METAL LOCKERS 10 51 13 - 1

- a. Assembly: Do not use bolts, screws, or rivets to assemble locker bodies.
- b. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
  - 1) Twin-frame all-welded construction, consisting of the following:
    - (a) 16 gauge 1-1/2-inch-high continuous bottom with reinforcing channels welded to the underside at each side panel providing a rigid unit base.
    - (b) 16 gauge continuous flat top.
    - (c) 16 gauge solid sides integral with front vertical frame.
    - (d) 18 gauge solid back.
- B. Doors: 14 gauge with a full height door stiffener.
- C. Handle: Deep-drawn seamless stainless steel recessed handle.
- D. Latching: Single-point maintenance-free quiet latching system, 11 gauge MIG welded latch.
- E. Hinges: 16 gauge continuous piano hinge with powder coat finish to match locker color.
- F. Coat Hooks: Stainless steel or zinc-plated steel.
- G. Number Plates: Polished aluminum with not less than 3/8-inch-high etched numbers attached to door with two aluminum rivets.

#### 2.04 LOCKER BENCHES

A. See Section 10 51 53 - Locker Room Benches.

#### PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds per anchor.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install fittings if not factory installed.
- G. Replace components that do not operate smoothly.

# 3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

**END OF SECTION** 

10 51 13 - 2 METAL LOCKERS

## SECTION 10 51 53 LOCKER ROOM BENCHES

## **PART 1 GENERAL**

#### 1.01 SECTION INCLUDES

A. Locker room benches.

## 1.02 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Manufacturer's published data on locker room bench construction, sizes and accessories.
- C. Shop Drawings: Indicate sizes, details and colors of locker room benches, pedestals, and installation hardware.

# 1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect locker room benches and pedestals from damage.

#### **PART 2 PRODUCTS**

#### 2.01 LOCKER ROOM BENCHES

- A. Locker Room Benches: Stationary type; bench top of solid high density polyethylene (HDPE); aluminum pedestals.
  - 1. Bench Thickness: 1-1/2 inches, with 1/4 inch radius on all edges.
  - 2. Bench Width: 9-1/2 inches.
  - 3. Bench Lengths: 72 inches.
  - 4. Pedestal Height: 16 inches.
  - 5. Number of Pedestals: Three per 72 inch bench.
  - 6. Bench Top Color: As indicated on drawings.
  - 7. Pedestal Color: Black aluminum.
  - Products:
    - a. Basis of Design: Scranton Products; Tufftec Locker Room Bench: www.scrantonproducts.com.
    - b. Substitutions: See Section 01 60 00 Product Requirements.

## B. Accessories:

- 1. Pedestal to Bench Top Fasteners: Stainless steel tamper-resistant Torx-head screws.
- 2. Pedestal to Floor Fasteners: Lead expansion shields with 2 inch stainless steel Phillips-head machine bolts.

## **PART 3 EXECUTION**

#### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

## 3.02 CLEANING

A. Clean locker room bench and pedestal surfaces per manufacturer's recommendations.

## **END OF SECTION**

# SECTION 10 56 13 METAL STORAGE SHELVING

# **PART 1 GENERAL**

## 1.01 SECTION INCLUDES

A. Four post shelving.

## 1.02 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Rated uniform shelf loads.
  - 2. Details of shelving assemblies.
  - 3. Installation methods.
- C. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.

#### 1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

# 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

#### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Four Post Shelving:
  - 1. Hallowell: www.hallowell-list.com.
  - 2. List Industries, Inc: www.listindustries.com.
  - 3. Penco Products, Inc: www.pencoproducts.com.
  - 4. Tennsco Storage: www.tennsco.com.

## 2.02 SHELVING - GENERAL

A. See drawings for layout and sizes.

# 2.03 FOUR POST SHELVING

- A. Four Post Shelving: Steel posts and shelves, heavy-duty, boltless assembly.
  - 1. Unit Width: 36 inches.
  - 2. Unit Depth: 18 inches.
  - 3. Unit Height: 84 inches, nominal.
  - 4. Shelf Capacity: 1,200 lbs. per shelf, minimum.
  - 5. Adjustability of Shelving: At intervals of 1-1/2 inches on center.
  - 6. Shelves per Unit: Five (5).
  - 7. Finish: Baked enamel, medium gloss.
  - 8. Color: Manufacturer's standard gray.
  - 9. Number of Units: As indicated on drawings.
- B. Posts: Formed sheet members; perforations may be exposed on face of members.
  - 1. Metal Thickness: 14 gauge, 0.0747 inch.
  - 2. Post Shape: Angle corner posts.
  - 3. Post Face Width: 2 inches, maximum.
  - 4. Connecting Hardware: Not requiring hardware for assembly.
- C. Bracing: Bracing shall not be required for unit stability. Each unit shall have four-way access for easy loading and unloading.

- D. Shelves: Formed sheet, finished on all surfaces.
  - 1. Metal Thickness: 16 gauge, 0.0598 inch.
  - 2. Shelf Connection to Posts: Rivets.

#### PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

## 3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

## 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- C. Out-Of-Square Tolerance Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

## 3.04 CLEANING

A. Clean shelving and surrounding area after installation.

## 3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

# **END OF SECTION**

# SECTION 22 01 00 - PLUMBING PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. General Provisions of the Contract, including General and Special Conditions, and Division 1 General Requirements, apply to the work specified in this Section.
- B. Electrical, DIVISION 26.
- C. All parts of this Section of the Specification take precedence over other sections of Division 22 and 23 (in connection with Plumbing work) unless noted otherwise.
- D. Comply with Section 23 01 00 with it in its entirety, including "PRIOR APPROVAL" requirements.

# 1.2 DESCRIPTION OF WORK

- A. The work to be performed under this Section of the work shall consist of but is not limited to the following general categories.
  - 1. Domestic water piping systems and equipment; sanitary piping systems and equipment; natural gas piping systems; demolition of existing piping and equipment.

#### 1.3 SCOPE

A. The plumbing system for this work includes cold water distribution, domestic water heating and distribution, vents and wastes, floor drainage, and natural gas distribution. All other items indicated on drawings or described in these specifications, and all other plumbing items needed for a complete and proper installation. (See "General Conditions" and "Scope of Work", and "Mechanical General Provisions" which is a part of this contract.)

## 1.4 QUALITY ASSURANCE

- A. General: Provide all new materials, labor, tools, equipment, transportation, incidentals and services necessary for the complete installation in every respect and the satisfactory operation of the plumbing systems as specified below and as shown on the drawings.
- B. Contractor shall verify conditions and check all measurements at job site.
- C. Wherever the word "supply", "provide" or similar term is used in the sense of providing apparatus or materials, it shall mean that Contractor shall furnish and connect such apparatus or materials referred to, unless otherwise specifically called for, at no additional cost to Owner.
- D. All statements made throughout these Specifications shall be considered as orders, directives, instructions, etc., to the Contractor to whom this Contract is awarded whether the word "Contractor" is used or not, unless otherwise noted.
- E. Insulation of piping does not protect pipe against freezing. All water bearing pipe must be run on the heated side of the building insulated envelope or provided with heat trace. If heat trace is required, and none is shown, the contractor shall provide heat trace, as well as all power circuits and controls, as work of this project and without additional expense or change order to the contract.

# F. Codes, Permits:

- 1. Obtain and pay for all permits and inspections required by all laws, ordinances, regulations, and public authority having jurisdiction. The following codes, standards and regulations in effect on the date of bid invitation shall be considered a part of this specification:
  - a. State Public Health Department Regulations
  - b. International Code Congress (ICC) Codes
  - c. Local and State Plumbing Codes
  - d. National Fire Protection Association
  - e. American Society of Mechanical Engineers
  - f. American Society for Testing Materials
  - g. Underwriters' Laboratories'
  - h. National Electrical Manufacturers Association

- i. OSHA Occupational Safety and Health Standards
- j. Local Utilities' Requirements
- 2. All material and workmanship shall comply with all latest applicable sections of local, municipal, parish or county, state, federal, industry and utilities company's rules, regulations, codes, ordinances and standards. Pipe sizes shown are minimum that will be allowed.
- 3. Should the Contractor perform any work that does not comply with the requirements of the applicable codes, standards and regulations, he shall bear all costs arising from the deficiencies.
- 4. Deliver copies of all certificates of inspection to Architect for delivery to Owner upon completion of the work.
- 5. Do not conceal any work until it has been inspected and tested.
- Terminology used in these specifications is that of the ICC International Plumbing Code (IPC).
- 7. Should work shown on these drawings and specifications be located in any area which levies a SEWER USE FEE or surcharge, this cost shall be included in the Contractor's bid unless specifically omitted by instructions in the General or Special Conditions.
- 8. Should local utility require any payment or fee for providing water or gas service to the facility, the cost shall be included in Bid.
- 9. All applications required shall be filled in the Owner's name.
- 10. Should work shown on the Contract Documents not be as strict as "local interpretations" of the local code, the Contractor shall make his bid in accordance with the local requirements and shall call the Architect's attention to the changes required to comply with the above.
- 11. Inspections: Obtain and pay for all inspections, required by all laws, ordinances, rules, regulations, or public authorities having jurisdiction. This Contractor shall obtain and pay for all certificates of such inspections, and file such certificates with the Owner.
- 12. Contractor shall be a licensed plumbing locally.

# G. Drawings and Specifications:

- 1. Drawings and Specification are complementary to each other. What is called by one shall be binding as if called for by both.
- 2. All methods of construction, details of workmanship and detailed arrangement of all work where not specifically described herein or indicated on the drawings, shall be subject to the control and approval of the Architect.
- 3. Architect shall render a decision in writing as to the space allotment in congested areas, which decision shall be binding on all. No claims for "extras" due to such decisions will be allowed, even though the work has already been installed.
- 4. Submit shop drawings for review on all fixtures, equipment and accessories.
- 5. It shall be the responsibility of the Contractor to use the Contract Document Drawings and these Specifications for a basic layout of the Plumbing Systems. Contractor shall not be permitted to change this basic method of distribution of the system details without submitting drawings for review and acceptance before fabrication and installation, and in particular with reference to exposed piping.
- 6. Plumbing drawings are diagrammatic; see Architectural drawings and building for dimensions and conditions not shown. Drawings do not show all fittings or details, but must be followed generally. Changes must be approved in writing. Obtain Architect's written decision in case of doubt as to intent of drawings or specifications. Failure to obtain written decision will leave this contractor liable for damage to work of other trades and responsible for corrections required by Architect.
- 7. Plans and Riser Diagrams (Risers): Plumbing Plans and Risers are complementary to each other. What is called for by one shall be binding as if called for by both. Where pipe sizes differ from the plans to the risers, it shall be considered as a drafting inaccuracy and the larger of the sizes shall be provided.

## 1.5 RESPONSIBILITY OF THE CONTRACTOR

- A. Contractor shall examine all drawings, specifications, addendums, and the Site of the work. He should familiarize himself with the character of work, coordination required with other trades, and any conditions that affect the completion of this work. No consideration will be given at a later date for any alleged misunderstanding as to the requirements, materials to be furnished, or any special requirements due to the nature of the job site or local conditions.
- B. Items obviously omitted from the plans and specifications shall be called to the attention of the Architect before bidding. After the award of the contract, any changes, additions, or rearrangements necessary to complete the work as outlined shall be at this Contractor's expense.
- C. The utilities shown are based on the best information available to the Designers and is for Bidding purposes and indication of desired routing only. The Contractor is required to coordinate with the required utilities prior to entering Bid, and Bid so as to include all costs of obtaining utilities as required by the drawings.

# 1.6 SUBMITTALS

- A. See paragraph on Submittals in Section 23 01 00.
- B. Submit for review complete data, cuts, capacities, type, and grade for review of fixtures, trim, pipe, insulation (jackets and fittings), and all other major components. Submit within 30 days of signing of general contract. Submit all items at one time in a bound submittal package with a cover sheet identifying all items submitted. Partial submittals will be rejected.
- C. Where plumbing fixtures are specified by manufacturer name and model, and a substitution manufacturer and model fixture is proposed, the submittal shall include a cross reference guide published by the manufacturer actually specified indicating that the proposed fixture and manufacturer is an appropriate substitution. In such cases where no such cross reference is published, provide cut sheets for both the specified fixture and the proposed fixture to facilitate evaluation by the Engineer.
- D. Materials, fixtures, or equipment installed without review or after rejections shall be replaced by this contractor with acceptable items at Architect's direction.
- E. The supplier, by submitting, certifies that his materials and/or equipment are satisfactory for the application for which they are proposed.
- F. Contractor agrees that submittals processed by the Engineer are not change orders; that the purpose of submittal by the contractor is to demonstrate to the Engineer that the contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and materials he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.
- G. Contractor further agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the design drawings and specifications shall be followed.

# 1.7 WORKMANSHIP

- A. Work to be orderly, neat, workmanlike in appearance, done by skilled craftsmen. Any work not so installed shall be removed and replaced without additional cost to owner or Design Professionals.
- B. Work shall be first class and in accordance with best practice. Pipe shall be cut clean, properly reamed, threaded or soldered, erected plumb and secure. Make changes in pipe size with reducing fittings.
- C. At all stages of installation, protect pipe openings, fixtures, and equipment against the entrance of foreign materials.

## 1.8 SAFETY

A. Perform all work in a safe manner. Protect all workmen and others on site. Barricade (light if necessary) all ditches, holes, openings through floors and other hazards. Comply with all health and safety regulations. Contractor is solely responsible for job site safety.

## 1.9 COOPERATION

A. Cooperate with all crafts; schedule work as needed; do not delay other trades; maintain necessary competent mechanics and supervision on the job at all times.

#### 1.10 INCIDENTAL WORK INCLUDED

- A. Cutting of structure (patching to be done by the affected trade at this contractor's expense). Secure Architect's approval where strength or appearance is affected.
- B. Necessary foundations not shown on Architectural or Structural plans.
- C. Motors, controls, control devices, control wiring, all as required for a complete system shall be by this contractor unless shown on the electrical drawings and included in that section. All electrical work shall comply with the Division 16 Electrical sections of the specifications.
- D. All ferrous metal exposed to weather shall be prime coated with a primer to match the metal and finished with a two coat application of finish paint of color and type selected by the Architect. Where the finish painting is specified in the section on painting, the two final coats may be omitted, but the metal shall be prime coated before rusts starts to form.

# 1.11 QUESTIONS AND CLARIFICATIONS

A. Contractor shall not rely on any verbal clarification of the drawings and specifications. Any questions shall be referred to the Architect/Engineer at least seven (7) working days prior to the bid date to allow clarification by addendum. After seven days prior to bidding, the bidder shall make his own decision and, if necessary, qualify his bid.

## 1.12 QUALIFICATIONS

- A. Contractor shall have at least three (3) years of successful installation experience on plumbing work similar in size and scope to this project.
- B. Contractor shall have an established service department capable of providing service inspection or full maintenance contract if requested by the Owner. One year service for adjustment shall be included as a part of this contract.

## 1.13 CHANGES

A. If during construction desirable or necessary changes become apparent, advise the Architect and secure his decision in writing; otherwise make no deviation from the system as detailed.

#### 1.14 CLEARING AND ADJUSTING

A. Upon completion of work, clear all drains, traps, pipe lines, and plumbing fixtures. Adjust all valves, pack stuffing boxes, remove rubbish and leave work in clean and operating condition.

#### 1.15 FOUNDATIONS

A. Provide foundations, supports, etc., not specified under other sections and as required to mount equipment in a workmanlike and structurally sound manner. Consult drawings pertinent to other trades to determine extent of their work.

# 1.16 GUARANTY

A. All piping, equipment, fixtures, and related material shall be guaranteed in writing against defective materials and workmanship for a period of one year from date of acceptance. After notification, corrections shall be made promptly at no cost to the owner. Any defects due to faulty materials, equipment, method of installation or workmanship, and consequent damage resulting from such defects within the one-year guaranty period, shall be repaired or replaced promptly upon notice and without any expense to the Owner.

#### **PART 2 - PRODUCTS**

## 2.1 GENERAL

- A. All products shall comply with the applicable sections of the Plumbing Code in effect in the building location. Where bidder is not sure, he is advised to determine what limitations, if any, are imposed at the site. All bids are assumed to be on approved material. Bidders/Contractors shall not use a lesser material than that specified even if allowed by code at the building site.
- B. Lead-Free Requirements:
  - 1. Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
  - 2. This requirement supersedes specific model numbers stated either in these specifications or on the drawings, should a non lead-free model number be used for products designed for dispensing potable water.
- C. For ease of maintenance and part replacement, and to the maximum extent possible, use equipment of a single manufacturer. The Architect reserves the right to reject any materials list which contains equipment from various manufacturers if suitable equipment can be obtained from fewer manufacturers, and to require source of materials to be unified to the maximum extent possible.
- D. All materials and equipment installed in HVAC return air plenums shall have a 25/50 flame spread/smoke developed index maximum when tested in accordance with ASTM E 84.
- E. All products shall be new, of first line quality of grade and type shown on the drawings and specified, or equals accepted by the Architect/Engineer in writing.
- F. All products shall be in current production with no notice having been given that such product is to be drastically changed, modified, or discontinued from production.
- G. The supplier, by submitting, certifies that equipment being processed is proper for the application intended and that it has the capacity specified.

#### 2.2 MATERIALS

- A. Building Soil, Waste, Storm and Vent Piping:
  - Underground: service weight cast iron, bell and spigot, conforming to ASTM A74 as manufactured by AB&I, Charlotte, or Tyler, with lubricated rubber compression joints conforming to ASTM C1563.
  - 2. Above ground: Cast iron no-hub system, manufactured by AB&I, Charlotte, or Tyler, with neoprene gasket conforming to ASM C564, type 302 stainless steel shield and four clamp (pipe sizes 4" or less) or six clamp (pipe sizes larger than 4") heavy-duty stainless steel clamps, equal to Anaco Husky SD 4000.
  - 3. All cast iron soil pipe, fittings and clamps shall conform to the requirements of CISPI Standard 301, ASTM A-888 or ASTM A-74 and be marked with the collective trademark of the Cast Iron Soil Pipe Institute. All pipe and fittings shall be certified and marked NSF.
- B. Hot and Cold Piping (Inside Building):
  - 1. Underground: Use Type "K" copper, soft drawn; in tunnels: use Type "K" hard drawn; ASTM B-88, with wrought copper fittings ANSI B16.22. Join underground or in tunnel fittings with silver solder AWS-ASTM BCUP-5. Pipe below floor slabs shall have joints made by looping up in wall out of the slab, no joints under the slab will be permitted.
  - 2. Above ground: Use Type "L" copper tubing, hard drawn, with same fittings as specified above, joined with lead free 95-5 solder, ASTM B32 alloy, Grade 5A except for any special systems requiring temperatures higher than 250 degree F or pressures above 125 psi for which alloy E, alloy HB, or brazing materials shall be used.
  - 3. Nominal pipe sizes are shown on the Drawings.
  - 4. Copper tubing air chambers shall be provided at each fixture supply and piece of equipment and shall be line size and 18 inches in length. Provide manufactured water hammer arrestors where shown.
  - 5. Use dielectric unions at all dissimilar pipe connections.

C. Insulation: Hot and cold water piping to have 3/4" thick flexible cellular pipe insulation. Omit insulation on tempered water from mixing valve to safety eyewash.

## 2.3 VALVES AND COCKS

- A. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim, Threaded Ends:
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. Hammond Valve.
    - c. KITZ Corporation.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
  - 2. Description:
    - a. Standard: MSS SP-110 or MSS SP-145.
    - b. CWP Rating: 600 psig.
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.
    - e. Ends: Threaded.
    - f. Seats: PTFE.
    - g. Stem: Stainless steel.
    - h. Ball: Stainless steel, vented.
    - i. Port: Full.
- B. Drain valves shall be "NIBCO", #763, 3/4" size, with approved anchors from flange to walls or columns. Provide screw-on type backflow preventers.
- C. Wall hydrants shall be as specified scheduled on the Drawings.

#### 2.4 ACCESS PANEL

- A. Provide access to all parts requiring service such as valves, regulators, traps, water hammer arrestors, etc., and where shown. Access doors shall be of the size required to properly service the item, but generally not smaller than 12" X 12". Where access doors cannot be provided for structural or architectural reasons, this shall be called to the Architect's attention.
- B. Access panels and doors shall have the same fire rating as the wall, ceiling, floor, or construction in which installed.
- C. Access doors in painted areas shall be prime coated with finish painting under the Painting section.
- D. In wet areas or areas with ceramic tile floors or walls, the access doors shall be aluminum. Stainless Steel is prohibited as it is not compatible with pool environments.
- E. Access doors shall be provided with a concealed key operated lock and concealed hinges.

## **2.5 UNIONS**

- A. Use a union in the connection to each valve and each piece of apparatus equipment, so that it may be readily removable. In copper lines, up to and including 4" sizes, use cast brass or bronze unions, with copper soldered connections and ground joints.
- B. Unions in drainage pipes on fixture side of traps may be slip or flanged joints with soft rubber or leather gaskets.
- C. Unions 2" and smaller shall be ground joint type with flanges being used in pipes larger than 2".

# 2.6 **SUPPORTS**, ANCHORS, AND SEALS

- A. Types of supports, anchors, and seals specified in this article include the following:
  - 1. Horizontal-Piping Hangers and Supports.

- 2. Vertical-Piping Clamps.
- 3. Hanger-Rod Attachments.
- 4. Building Attachments.
- 5. Saddles and Shields.
- Miscellaneous Materials.

#### B. QUALITY ASSURANCE:

## 1. MSS Standard Compliance:

- a. Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.
- b. Select and apply pipe hangers and supports, complying with MSS SP-69.
- c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
- d. Terminology used in this article is defined in MSS SP-90.

## C. SUBMITTALS:

1. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of support, anchor, and seal. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

#### D. HORIZONTAL-PIPING HANGERS AND SUPPORTS:

- 1. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with ANSI-MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
- 2. Adjustable Steel Clevises: MSS Type 1.
- 3. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
  - a. Plate: Unguided type.
  - b. Plate: Guided type.
  - c. Plate: Hold-down clamp type.

#### E. VERTICAL-PIPING CLAMPS:

- General: Except as otherwise indicated, provide factory- fabricated vertical-piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
- 2. Four-Bolt Riser Clamps: MSS Type 42.

## F. HANGER-ROD ATTACHMENTS:

1. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in

accordance with MSS SP-69 and manufacturer's published product information. Select only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

2. <u>Swivel Turnbuckles</u>: MSS Type 15.

# G. BUILDING ATTACHMENTS:

- 1. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- 2. Concrete Inserts: MSS Type 18.
- 3. Side Beam or Channel Clamps: MSS Type 20.
- 4. C-Clamps: MSS Type 23.
- 5. <u>Side Beam Brackets</u>: MSS Type 34.
- 6. <u>Manufacturer</u>: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - a. Fee & Mason Mfg. Co., Div. of A-T- Inc.
  - b. ITT Grinnel Corp.

#### H. SADDLES AND SHIELDS:

- 1. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- 2. <u>Protection Saddles</u>: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- 3. <u>Protection Shields</u>: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- 4. <u>Thermal Hanger Shields</u>: Constructed of 360° insert of high density, 100 psi, and waterproof calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.
- 5. <u>Manufacturer</u>: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
  - a. Elcen Metal Products Co.
  - b. Pipe Shields, Inc.

# I. HANGER RODS

- 1. Hanger Rods: Shall be all threaded rod and shall have the following diameters:
  - a. 3/8" for up to 2" diameter pipe.
  - b. 1/2" for 2-1/2" to 4" pipe.
  - c. 5/8" for 5" and 6" pipe.
  - d. 3/4" for 6" and 8" pipe.
- 2. Hanger Spacing: Shall be as followed (except not less than two hangers per length of pipe):
  - a. Cast Iron pipe: 5'-0" spacing maximum and at each hub, on both sides of horizontal no-hub fittings, and at each trap.

- b. Steel Pipe: 6'-0" spacing up to 2" diameter and 10'-0" for 2-1/2" diameter and larger.
- c. Copper pipe: 6'-0" spacing up 2" diameter and 10'-0" for 2-1/2" diameter and larger.
- d. Plastic pipe: 4'0" for up to 2" diameter and 6'0" for 2-1/2" to 6" diameter, 10'0" for pipes larger than 6" diameter.
- 3. Hanger Locations in wood and light gage structures: No multiple hangers shall be permitted on a single building wooden or light gage steel member. Hangers shall be staggered to distribute loads evenly over the structure and additional longitudinal structural members provided to evenly distribute loads. Provide hanger locations as part of the required piping shop drawings.

## J. MISCELLANEOUS MATERIALS:

- 1. Metal Framing: Provide products complying with NEMA STD ML 1.
- 2. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- 3. <u>Heavy-Duty Steel Trapezes</u>: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- 4. <u>Pipe Guides</u>: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

## 2.7 CLEANOUTS AND EXTENSIONS

- A. Cleanouts shall be cast iron bodies with brass plugs. They shall be extended full size to floors and wall faces, but shall not be larger than 4". Extension to floor shall be made with combination "Y" and eighth bends.
- B. Provide cleanouts in sanitary, waste and drain lines as shown, as required by local Code, and as follows:
  - 1. At the bottom of each exposed fixture trap which is not integral with the fixture.
  - 2. At the end of each branch drainage line.
  - 3. At each change of horizontal direction greater than 45 degrees.
  - 4. At the base of each stack and in horizontal drain lines at intervals of not more than 50 feet apart in lines smaller than 4", 75 feet apart in lines of 4" nominal size, and 100 feet apart in lines larger than 4".
- C. Install cleanouts so that they are readily accessible.
- D. Cleanouts in interior floor construction shall be equal to Smith 4020 or 4040 (for floors with square tile), with scoriated cover, nickel-bronze finish. Cleanouts in walls and ceilings shall be as specified under "Access Panels".
- E. Cleanouts at grade shall be provided with a 12" diameter by 4" thick monument allow for locating and turf grooming.

## 2.8 TRAPS

- A. Traps for floor drains, hub drains, etc., shall be standard C.I.S.P.I. cast iron P-traps, with hub and spigot joints for lead caulking or no-hub systems coated with Coal Tar Varnish while hot, except traps for drains used in fan rooms, which shall be of similar type cast iron but deep seal P-traps having a minimum 4.75 inch seal.
- B. Traps for all floor drains shall have ProSet Trap Guard or Jay R. Smith Quad Close Trap Seal devices. No traps are to have trap primers.
- C. Comply with trap requirements as specified for individual fixture type, in lieu as specified here, when specified differently for fixture type.

#### 2.9 FLASHING

- Flashing for soil and vent stacks passing thru roof shall be furnished under this Section of the Specifications.
  - 1. Flashing for bituminous roofs shall be formed of minimum 4-pound sheet lead and shall be of thimble and counterflashing type. Base shall be made so that coverage of 12" plus the diameter of the boot is obtained. Height of flashing shall be sufficient to allow for ample turn-down into pipe.
  - 2. Flashing for membrane roof and metallic roofs shall be in accordance with the roofing manufacturer's recommendations.

#### 2.10 SLEEVES AND ESCUTCHEONS

- A. Provide galvanized sheet metal sleeve for all pipes at floors, ceilings, partitions; steel pipe sleeve two pipe sizes larger than pipe at walls and footings. Sleeves for all walls into and out of the natatorium or training rooms to be epoxy coated galvanized.
- B. Sleeves in structural beams to be furnished by General Contractor at location set by this contractor.
- C. Provide nickel plated escutcheons with spring lock or set screw at ceilings, floors, and walls for all pipes.

#### 2.11 SUPPORTS, ANCHORS, AND SEALS

- A. See Section 230526.
- B. HANGER RODS
  - 1. Hanger Rods: Shall be all threaded rod and shall have the following diameters:
    - a. 3/8" for up to 2" diameter pipe.
    - b. 1/2" for 2-1/2" to 4" pipe.
    - c. 5/8" for 5" and 6" pipe.
    - d. 3/4" for 6" and 8" pipe.
    - e. 904L stainless steel at Natatorium and pool equipment rooms, provide matching nuts and washers
  - 2. Hanger Spacing: Shall be as followed (except not less than two hangers per length of pipe):
    - a. Cast Iron pipe: 5'-0" spacing maximum and at each hub, on both sides of horizontal nohub fittings, and at each trap.
    - b. Steel Pipe: 6'-0" spacing up to 2" diameter and 10'-0" for 2-1/2" diameter and larger.
    - c. Copper pipe: 6'-0" spacing up 2" diameter and 10'-0" for 2-1/2" diameter and larger.
    - d. Plastic pipe: 4'0" for up to 2" diameter and 6'0" for 2-1/2" to 6" diameter, 10'0" for pipes larger than 6" diameter.
  - 3. Hanger Locations in wood and light gage structures: No multiple hangers shall be permitted on a single building wooden or light gage steel member. Hangers shall be staggered to distribute loads evenly over the structure and additional longitudinal structural members provided to evenly distribute loads. Provide hanger locations as part of the required piping shop drawings.

## 2.12 WATER SYSTEM ACCESSORIES

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. Cash Acme; a division of Reliance Worldwide Corporation.
    - c. FEBCO; A WATTS Brand.
    - d. WATTS.
    - e. Zurn Industries, LLC.
  - 2. Standard: ASSE 1001.
  - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.

- 4. Body: Bronze.
- 5. Inlet and Outlet Connections: Threaded.
- Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers:
  - 1. Standard: ASSE 1011.
  - 2. Body: Bronze, nonremovable, with manual drain.
  - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
  - 4. Finish: Chrome or nickel plated.

## C. Hose Bibbs:

- Standard: ASME A112.18.1 for sediment faucets.
- 2. Body Material: Bronze.
- 3. Seat: Bronze, replaceable.
- 4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
- 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
- 6. Pressure Rating: 125 psig.
- 7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
- 8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
- 9. Finish for Service Areas: Chrome or nickel plated.
- 10. Finish for Finished Rooms: Chrome or nickel plated.
- 11. Operation for Equipment Rooms: Wheel handle or operating key.
- 12. Operation for Service Areas: Operating key.
- 13. Operation for Finished Rooms: Operating key.
- 14. Include operating key with each operating-key hose bibb.
- 15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

# D. Water-Hammer Arresters:

- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg. Co.
  - b. Precision Plumbing Products.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
- 2. Standard: ASSE 1010 or PDI-WH 201.
- 3. Type: Metal bellows or Copper tube with piston.
- 4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.
- E. Standard, Plumbed Emergency Eyewash Units:
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Acorn Safety.
    - b. Bradley Corporation.
    - c. Guardian Equipment Co.
    - d. Haws Corporation.
  - 2. Piping:
    - a. Material: Galvanized steel.
    - b. Unit Supply: NPS 3/4"
    - c. Unit Drain: Outlet at back or side near bottom.
  - 3. Eyewash Unit:
    - a. Capacity: Not less than 0.4 gpm for at least 15 minutes.
    - b. Supply Piping: NPS 1/2 with flow regulator and stay-open control valve.
    - c. Control-Valve Actuator: Paddle.

- d. Spray-Head Assembly: Two receptor-mounted spray heads.
- e. Receptor: Stainless steel bowl.
- f. Mounting: Floor mounted.
- g. ASSE 1071 lead free safety eyewash mixing valve, chrome plated with controller with integral check stops, removable cartridge with stainless steel piston and thermal motor or bimetallic thermostat. Standard rough bronze finish. Max pressure 125 psi. Provide thermometer on outlet, cut off valves on inlet and outlet

## F. Water-Temperature Limiting Devices:

- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Flow Controls; Conbraco Industries, Inc.
  - b. Armstrong International, Inc.
  - c. Cash Acme; a division of Reliance Worldwide Corporation.
  - d. Leonard Valve Company.
  - e. Symmons Industries, Inc.
  - f. WATTS.
- 2. Standard: ASSE 1017.
- 3. Pressure Rating: 125 psig.
- 4. Type: Thermostatically controlled, water mixing valve.
- 5. Material: Bronze body with corrosion-resistant interior components.
- 6. Connections: Threaded inlets and outlet.
- Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperaturecontrol handle.
- 8. Tempered-Water Setting: 105 deg F.
- 9. Tempered-Water Design Flow Rate: 0.5 gpm.
- 10. Valve Finish: Chrome plated.

## 2.13 FLOOR DRAINS

- A. Floor drains shall be the size of the pipe to which they are connected. Install temporary closures during construction. Each drain shall have deep seal P-trap.
- B. Floor drains shall be equal to the J. R. Smith figure numbers as scheduled on the plans.
- C. Refer to section on Traps for requirements regarding trap primers.
- D. Drains shall be suitable for casting into floor slabs in locations indicated.
- E. Provide drains with Polymer QuickLock ADA compliant grate.

## 2.14 EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- A. Equipment indicated below is to be furnished and set in place under another Section of these Specifications (or is to be provided by the Owner). Verify exact size and locations of vents, waste and supply connections from approved rough-in drawings and/or catalog cut sheets. All water and gas connections are to be provided with stop valves.
- B. HVAC Equipment: Provide gas supplies with stop valve to within two (2) feet of equipment connection. Provide water line with backflow preventer for chilled and hot water make-up water shown on the plans. Provide vacuum breaker in humidifier make-up. Terminate water supply within two (2) feet of point of connection. Coordinate with HVAC contractor to insure service will be at proper location. Final connection to equipment will be specified under the HVAC Sections of these Specifications. Provide pressure reducing valves at all equipment requiring reduced pressure service.

#### 2.15 GAS SERVICE PIPING AND APPURTENANCES

A. Pipe above ground to be Schedule 40 Black Steel with screwed 125 PSI malleable iron fittings for two inches and below, welded fittings above two inches.

- B. Gas cocks shall be square head, iron body with brass plugs, 125 PSI working pressure, lubricated for two inch size and larger.
- C. Provide 3-inch long dirt leg, cock and union at each equipment and/or appliance connection.
- D. Provide a gas pressure regulator at each item of equipment utilizing gas.

## **PART 3 - EXECUTION**

#### 3.1 WATER DISTRIBUTION PIPING

- A. Extend from the termination of the water service to every fixture, water heater, or outlet requiring hot or cold water. Provide stop valve and a drain for the system. Every low point shall be drained with a drain valve.
- B. Every fixture connection shall be provided with a stop valve.

# 3.2 BUILDING DRAIN, WASTE, AND VENTS

- A. Building drain terminates into the building sewer shown above approximately five feet outside the building line.
- B. The Waste and Vent system shall be generally as shown on the drawings with changes on the job as required to meet the job conditions. Any major change from that shown on the drawings shall be approved by the Architect.
- C. All pipe shall be supported in a manner such as to prevent excessive stress
- D. The bottom of all stacks shall be washed by a fixture whether required by local code or not.
- E. Extend vent stacks 12" above the roof and flash with lead flashing furnished by this contractor and installed into the roof by the roofer. Top of flashing turned into the stack by this contractor.
- F. There shall be no horizontal offset in vents less than 6" above the flood rim of the highest fixture in the group.

## 3.3 TESTING

- A. Notify Architect, Engineer and local authorities three working days before test are to be made. No joints or fittings are to be concealed until tested, and any defects shall be corrected by replacement with new materials. Retest until satisfactory.
- B. Follow test as described in the 2009 edition of the ICC International Plumbing Code or as follows (whichever is most stringent):
  - 1. Sewer System:
    - a. Water Test fill system with water (minimum of 10' head) and hold for 45 minutes without drop in water.
    - b. Sewer Ball pass wooden sewer ball through system using only water to wash through. Ball shall pass freely.
    - c. Peppermint Test seal all traps of fixtures and introduce peppermint into vent from roof. There shall be no odor in building.

## 2. Water System:

Impose pressure of 150 psi; with system full of water, hold for 4 hours without pressure drop. If air pressure is used, hold pressure for 8 hours without drop except as temperature drops. Provide pressure gauge and leave in place.

# 3.4 CAST IRON PIPE SYSTEMS

A. Fittings of the no-hub, push type, or lead and oakum shall be installed as recommended by the manufacturer using tools as recommended by them. Take care to prevent shifting or settling of pipe.

## 3.5 SOLDER TYPE FITTINGS

A. Solder type fittings below a slab are prohibited. Loop pipe up in wall and make soldered joint or fitting.

- B. All solder type fittings shall be made up using specified solder except for any special systems requiring temperatures higher than 250 degree F or pressures above 125 psi for which alloy E, alloy HB, or brazing materials shall be used. Clean pipe and fittings bright with sand paper or wire brush and apply paste flux (liquid flux is not acceptable) and assemble joint. Apply heat evenly to the pipe and fittings and apply solder to fill the joint by capillary action. Clean joint of excess solder before it cools. Fittings discolored by heat shall be removed and the joint remade.
- C. The Architect or Engineer may require the cutting out and destructive testing of up to five joints of their own selection to determine the type of workmanship being performed and the 'fullness' of the solder in the joint. Such joints shall be remade by the contractor at his expense. Should the joints tested show large voids or other indication of poor joints, the workman making the joints shall be replaced and other joints tested to determine the extent of such problems.
- D. Every connection between ferrous and non-ferrous metals in pipe, tanks, etc. shall be separated by a dielectric union or flange equal to Wedge Seal

# 3.6 LAYOUT

- A. This contractors responsibility includes:
  - 1. Setting of floor and wall sleeves in proper locations.
  - Informing other trades of location of and size of chases, stacks, cleanouts, etc., that will later relate to their work.
  - 3. Providing access to all items requiring routine service.
  - 4. Setting the elevation of the floor drain tops to provide for a slope of 1/16" per foot toward the drain. This requires coordination with the concrete subcontractor, the General Contractor and rechecking at the time the pour is being made.
  - 5. Coordinating with the HVAC Contractor to insure that the actual equipment installation will not interfere with the mechanical room floor drain locations shown and that adequate clearance is provided for the routing of condensate drains to these floor drains.

## 3.7 HANGARS AND SUPPORTS

- A. All pipe shall be supported in a manner such as to prevent excessive stress and variations in supporting forces onto the supporting forces onto the supporting structures. Anchor and hang in such a way as not to interfere with natural expansions and contraction and the anchors and guides shall be capable of withstanding such forces imposed on them by the expansion and contraction of piping.
- B. All vertical piping extending from floor to floor shall be supported vertically at each floor with approved riser clamps and secured horizontally.
- C. All pipe hangers shall be of sufficient size to allow for pipe insulation.
- D. All insulated lines shall have supports for piping placed on outside of insulation at every support anchor or guide. Hangers shall not be in contact with the pipe. Saddles between hangers and insulation shall be galvanized iron shields.

#### 3.8 GRADES

- A. Pipe shall grade in direction of flow not less than the following
  - 1. Building Sewer and Building Drain 1/8" per foot.
  - 2. Waste and Vent 2-1/2" and smaller 1/4" per foot.
  - 3. Waste and Vent 3" and larger 1/8" per foot.
  - 4. Gas 1/8" per foot.
  - 5. Water piping shall be pitched to allow complete draining.

# 3.9 INSTALLATION OF PIPES

- A. All threaded pipes shall be reamed to remove all cutting lips from the inside edge and shall be threaded with clean dies to the proper depth. Cuts shall be clean and not gouged or rough. Apply lubricant to male thread only.
- B. All buried thermoplastic piping shall be installed per ASTM D2321

- C. All copper pipes shall be reamed to remove all cutting lips from the inside edge.
- D. Pipe shall be laid or supported in a straight and true manner with fittings used to make all changes in direction.

## E. Cutting and Patching:

- 1. No reinforcing steel in slabs, ceilings, roof, etc., shall be shifted or cut, nor will any structural members be cut or altered, without the specific approval of Architect unless the Contract Drawings show exact details for same. Do not make deep cuts into building framing without the specific approval of the Architect. Provide metal and/or timber reinforcing of joist, studs, plates, etc., where such cuts are made, as directed by the Architect.
- 2. Provide basic patching between masonry openings and sleeves, drains, cleanouts, etc., up to the finished surfaces, by sealing these openings with an approved non-shrinking grout, installed according to manufacturer's written instructions. The surface patching and finishing shall also be done under this section of the work in a manner as approved by Architect.
- 3. Where holes or cut-outs are made in flooring for the installation of drains, vents, etc., remove only enough concrete and reinforcing to install piping, etc. Preserve as much reinforcing steel as possible. Do not cut into grade beams or footings. Restore and add to floor reinforcing steel as directed by the Architect. Rebuild floor to original thickness and finish with non-shrinking 3,000 P.S.I. concrete.

# F. Pipe Sleeves:

- 1. Each pipe passing through masonry and/or concrete construction shall be free from the structure and shall pass through a sleeve.
- 2. Each sleeve shall extend through its respective floor, wall, etc., and shall be cut to be flush with each outer finished surface, except sleeves in floors, which shall extend one inch above finished floor unless noted otherwise. Sleeves shall be Schedule 40 galvanized steel pipe.
- 3. Unless otherwise noted, the inside diameter of all sleeves shall be a minimum of one inch larger than the outside diameter of the pipe or conduit it serves, or a minimum of one inch in diameter larger than the outside diameter of the insulation on insulated lines.
- 4. All holes required in concrete or masonry structures shall be cored with a diamond bit core drilling machine. No holes shall be cored through beams, joists or columns. Every safety precaution shall be taken in coring holes to prevent electric shock should any energized circuits be encountered.
- 5. Caulk space full between sleeves and pipe or conduit, insulated or plain, above grade, with an approved asbestos rope to provide a positive smoke seal. Where holes have been cut in masonry for placing sleeves, the space between cut openings and sleeves shall be sealed as called for above under Paragraph "Cutting and Patching".
- 6. Where exposed piping passes through walls, ceilings, floors or partitions, provide chromium plated, pressed steel escutcheons, Crane 10B and C, or approved equal.

#### 3.10 CLEANING AND DISINFECTING

A. All potable water piping shall be flushed and disinfected prior to connection to domestic water supply. Disinfecting shall be carried out in accordance with State Sanitary Code and local regulations

#### 3.11 TESTS:

- A. Make tight and test all piping, valves, fittings, specialties and equipment required by regulatory authorities.
- B. Do not conceal any work until it has been tested and inspected. Notify Architect and proper authorities in ample time when any work is ready for inspection and testing.

## 3.12 ELECTRICAL:

A. All electrical work shown, noted and required to provide completely operating facilities shall be included as part of contract work.

Refer to DIVISION 26 - ELECTRICAL for materials and methods.

#### 3.13 PROTECTION DURING CONSTRUCTION:

- A. Install test plugs, wood plugs or caps in all open pipes at time of installation and do not remove until pipe is connected.
- B. Maintain pressure and pressure gauge on all water lines during construction. Use water except in cold weather.
- C. Drain all water from lines to prevent freezing.
- D. Protect all finished surfaces of fixtures and brass from any damage. Fixtures or brass of any type that is damaged, scratched, discolored shall be removed and replaced at this contractor's expense.

## 3.14 START UP AND SERVICE:

A. Place all items installed under this division into operation and instruct the owner' maintenance personnel in all points requiring service and maintenance: make all adjustments and/or service requirements to equipment during the warranty.

#### 3.15 VACUUM BREAKERS AND BACK FLOW PREVENTERS:

A. Install vacuum breakers above the highest piece of equipment to be protected. Location must be in area with floor drain, or provide other means of disposing of water that might drip out of vent opening. Vent may be piped to drain with use of air gap.

# PART 4 - FIXTURES AND EQUIPMENT (NOT APPLICABLE)

## 4.1 GENERAL REQUIREMENTS

- A. Furnish all plumbing fixtures, drains, and equipment as shown on the Architectural drawings. If architectural drawings differ from plumbing drawings, this shall be called to the Architect's attention before bidding.
- B. Fixtures and other equipment shall be furnished complete with all trim, fittings, and other devices which are generally considered necessary by trade, by craft standards and/or the Architect.
- C. Fixtures and equipment shall have the manufacturer's name or trademark imprinted on or attached by metallic name plate.
- D. All fixtures and all trim may be of different manufacturer than fixtures, but equal to that specified. See Paragraph 1.6 for submittal requirements when submitting fixtures other than those specified and/or scheduled by name.
- E. All exposed trim shall be chrome plated. Tops of all floor drains shall be chrome or nickel bronze unless otherwise noted
- F. Furnish china or matching plastic bolt caps for all toilets and urinals.
- G. Faucets, fittings, etc. scheduled on the Drawings are the catalog numbers as identified by name. This reference is for identifications of quality, and equal products of recognized manufacturers (ie: American Standard, Zurn, Symmons, Crane, Toto, T&S Brass) will be accepted as equal if submitted with full catalog data and engineering data.

# **END OF SECTION 22 01 00**

#### **SECTION 230100 - MECHANICAL GENERAL PROVISIONS**

#### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

## 1.2 DESCRIPTION OF WORK

- A. General: This section specifies several categories of provisions for mechanical work, including:
  - Certain adaptive expansions of requirements specified in Division 1, as uniquely applicable to mechanical work.
  - 2. General performance requirements within the mechanical work as a whole.
  - 3. General work to be performed as mechanical work, because of its close association with mechanical work.

# 1.3 SUMMARY OF MECHANICAL WORK

- A. Drawings: Refer to the drawings for graphic representations, schedules and notations showing mechanical work.
- B. Specifications: Refer to Divisions-22 and 23 sections for the primary technical specifications of mechanical work.
- C. General Outline: The facilities and systems of the mechanical work can be described (but not by way of limitation) as follows:
  - 1. Industrial Ventilation
  - 2. Air Distribution System
  - 3. HVAC control system
  - 4. Testing, Adjusting and Balancing.

# 1.4 SCOPE

- A. This section shall consist of providing all materials, labor, tools, plant and incidentals necessary to install and make ready for owner's beneficial use, complete mechanical systems including a system of air tempering for the proposed building as shown on the Drawings and called for in the Specifications. Completed Mechanical Systems means ready for operation, and that items omitted from drawings that are required for a complete and operational system will be furnished by the Contractor at no additional cost to the Engineer, or Owner.
- B. It is understood that the responsibility for the work of the entire project falls upon one Contractor (sometimes, herein referred to as the General Contractor). The Designers, however, understand the relationship between the Contractor and other organizations, outside of his, which the Contractor employs to assist him with this work. The Division 15 Specifications are addressed to the Contractor and it is his responsibility to perform the work (regardless of whom he may employ for assistance). The Division 23 Specifications are written, however, in an effort to assist the Contractor with subcontract employment (herein referred to as "This Contractor", "Mechanical Contractor", "Electrical Contractor", "Plumbing Contractor", "Control Contractor", etc., or above listed as "Subcontractor" in lieu of "Contractor"). This shall not be construed by the Contractor to alleviate him of any responsibility for the work, including its coordination amongst various trades, and placement of the same on others, nor shall this be construed to direct the Contractor to the employment of Subcontractors (with the exception of Testing Agencies).
- C. All references to "Contractor(s)" or "Subcontractor(s)" are referring to the Contractor and his coordination of responsibilities within the work of the Contract.
- Visit the site of work to observe dimensions, construction and details not shown on these Drawings.
- E. Wherever the word "supply", "provide" or similar term is used in the sense of providing apparatus or materials, it shall mean that Contractor shall furnish and connect such apparatus or materials referred to, unless otherwise specifically called for, at no additional cost to Owner.

#### 1.5 DRAWINGS AND SPECIFICATIONS

A. Consider as complementary each to the other. What is called for by one shall be binding as if called for by both. Where conflicts occur, obtain written clarification; otherwise provide the more expensive quality or quantity.

#### 1.6 COORDINATION OF MECHANICAL WORK

- A. General: Refer to the Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work including utilities and electrical work, and that such establishment is the exclusive responsibility of the Contractor.
- B. Arrange mechanical work in a neat, well organized manner with piping and similar services running parallel with primary lines of the building construction, and with a minimum of 7'0" overhead clearance where possible.
- C. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Give right-of-way to piping which must slope for drainage.
- E. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work (equipment).

#### 1.7 MECHANICAL PLANS

- A. The mechanical plans are intended to be diagrammatic based on one manufacturer's equipment. The plans are not intended to show every item in its exact location, the exact dimensions, or all the details of the equipment. Verify the exact dimensions of the equipment proposed.
- B. Installation shall be within the limitations imposed by the architectural, structural, electrical and plumbing, and fire protection (sprinkler) requirements with adequate space for maintenance.

# 1.8 QUALITY ASSURANCE, STANDARDS, AND SYMBOLS

- A. Contractor for this DIVISION must have installed at least three (3) similar type and size jobs and mechanical contracting shall be their primary business.
- B. Qualifications of Contractors: Must be properly licensed and established as a General Contractor and as an HVAC Contractor at location of the work and shall maintain locally adequate service facilities. The project is designed to bid for the mechanical Contractor to be the General Contractor. Refer to Division 1 for additional contractor requirements.
- C. General: Refer to the technical sections for general administrative/procedural requirements related to compliance with codes and standards. Specifically, for the mechanical work (in addition to standards specified in individual work sections), the following standards are imposed, as applicable to the work in each instance:
  - 1. AWS standards for welding.
- D. All work shall be in accordance with the latest editions adopted of following codes and regulations:
  - 1. National Fire Protection Agency
  - 2. Occupational Safety and Health Administration
  - 3. 2015 International Code Council, Inc. Codes
  - 4. State Building Code
  - 5. Local Building Codes
- E. Where any of the above are at variance with the drawings and specifications, the requirements of the above codes and regulations shall take precedence and the costs necessary to meet these shall be in included in the bid price.
- F. The contractor is solely responsible for meeting all OSHA regulations and insuring job site safety.

G. Symbols: Except as otherwise indicated, refer to the "ASHRAE Handbook of Fundamentals" for definitions of symbols used on the drawings to show mechanical work.

#### 1.9 QUESTIONS AND CLARIFICATIONS OF BID DOCUMENTS

A. Bidders shall not rely on any verbal clarification of the drawings or specifications. Any questions or clarifications shall be referred to the /Engineer at least five (5) working days prior to bidding to allow for issuance of an addendum. After the five (5) day deadline, the bidder shall make his own decision and qualify his bid if he feels it necessary.

# 1.10 SEVEN (7) DAY PRIOR APPROVAL

- A. This requirement for prior approval is independent of others called for in other Divisions of these specifications.
- B. Any fixture, equipment, material, or components of fixtures and equipment proposed to be furnished for this project, other than manufacturer's equipment actually named in the bid documents, shall have pertinent submittal data with descriptive cover sheet submitted to the Engineer. The request for prior approval shall include 1) the project bid date, 2) the specification section number referenced, 3) the paragraph referenced within that section, and 4) the manufacturer's name being requested for prior approval. This data shall be received by the Engineer seven (7) days and one hour prior to bid opening data for inclusion in an addendum if and when reviewed and accepted for bidding.
- C. This is for pre-bid review and is not to be regarded as submittals required for construction. It is understood that approval shall be for the manufacturer to quote the project during bidding, subject to the requirements of the contract documents.
- D. Bidder shall base his bid on items of equipment actually named in the bid documents or addendums issued prior to biddings. Verbal acceptance will not be accepted unless verified in writing. It is the bidders' responsibility to ascertain that all equipment has been accepted by requiring copies of the written acceptance.

## 1.11 GUARANTEES

- A. All equipment, materials and workmanship shall be guaranteed in writing for a period of one (1) year beginning with the date of acceptance. Special warranties will be called for under some sections of equipment. This warranty shall be in writing and shall include written copies of the factory warranties with expiration dates on items of equipment where the warranty date may differ from the acceptance date. No warranty shall start before the acceptance date.
- B. The contractor's warranty shall include at least two (2) inspections of the system to repair and/or replace any items found defective during this warranty period.
- C. After completion of the work, the Contractor shall operate the equipment he installs for a period of five (5) days, after which time it shall be considered as a test of satisfactory operation. During this time, he shall instruct the owner's operating personnel in the correct operation of the equipment.
- D. Contractor shall provide the owner with two (2) sets of manufacturer's operating and maintenance manuals and parts list for all equipment and materials furnished by him. In addition to the manufacturer's data, contractor shall provide a maintenance schedule listing routine maintenance operations and the frequency thereof.

# 1.12 SUBMITTALS:

- A. General: The Drawings and Specifications may make mention to specific Manufacturer's model numbers. It is understood that these model numbers direct the Contractor to a "Type" or "Series", and are not intended to indicate all suffix designations, prefix designations, or variations of types and models. The type, series, or variation of the model number given must be determined by including all specified items, performance, etc. specified, indicated, and/or detailed. Refer to the Division 1 sections for general requirements concerning work-related submittals (refer to other Divisions I sections for administrative submittals).
- B. SUBMITTALS

- 1. Submit all items, equipment, materials, etc. at the same time together in a single package with descriptive cover and table of contents. Submittal shall include a summary page listing all items contained therein. Submittal shall include illustrations, drawings and engineering data for review by the Engineer Submit all items at one time. Submittals shall be clearly designated as to the intended item with identification as to unit number or other marking to show location, service and function.
- 2. If electronic submittals are used, the submittal shall be in Adobe PDF format with each individual specification section bookmarked to allow for easy access to specific items. Specification sections to have nested bookmarks for each item/major piece of equipment covered by that specification.
- 3. The Contractor, by submitting, certifies that those submitted items, materials, equipment, etc., are those that, if not "rejected" or "returned for correction", shall actually be installed, without exception, addition or substitution, as work of the project.
- 4. By submitting the required submittals, the Contractor certifies that the Electrical Installer has reviewed all electric power using equipment has been reviewed by the Electrical Installer and that any and/or all power circuits have been coordinated and that all power circuits shall match the equipment provided, whether properly indicated on the Electrical Drawings or not. See also Paragraph 2.4.
- 5. Any equipment installed without prior (review) acceptance shall be subject to rejection and replacement unless such items were identified by name on the bid documents.
- 6. The supplier, by submitting, certifies that the materials or equipment proposed is satisfactory for the application intended and that the materials and equipment are in current production with no anticipated plans to cease production.
- 7. Contractor agrees that submittals processed by the Engineer are not change orders; that the purpose of submittals by the contractor is to demonstrate to the Engineer that the contractor understands the design and specification concept, and that he demonstrates this understanding by indicating which equipment and materials he intends to furnish and install with the fabrication and installation methods he intends to use.
- 8. Contractor further agrees that if deviations, discrepancies or conflicts between submittals and contract documents are discovered either prior to or after submittals are processed by the Engineer, the contract documents shall control and shall be followed.
- 9. Submittals shall include:
  - a. 1/4 scale shop drawings of equipment.
  - b. Power and fuel consumption, voltage and ampere rating.
  - c. Capacity and conditions at which rated.
  - d. Volts, phase and full load amps of each electrical item
- 10. When major items of equipment or systems are submitted as substitution for that which is called for by the contract documents, and significantly different dimensions or concepts are encountered in such proposal, the submittals shall include 1/4" scale drawings of proposed equipment and system layout with sections. These drawings shall indicate all spacial relationships between equipment, piping, duct, electrical work, building and space constraints, etc.

# 1.13 CONFLICTS

- A. Where any conflict between the requirements of these specifications and the requirements of the associated drawings occur, the more stringent requirements shall govern unless approval is obtained through the Engineer. All such conflicts shall be brought to the Engineer's attention.
- B. Where technical specifications include installation instructions, in their "Part 3 Execution" paragraph, for materials, items, equipment, etc. which are not mentioned in their "Part 2 Products" paragraph, it shall be considered as an editing inaccuracy and shall not be construed as Part 3 allowing the use of products not mentioned in Part 2.

# **PART 2 - PRODUCTS**

#### 2.1 GENERAL

- A. All products shall be new, of first line quality of grade and type shown on the drawings and specified, or equals accepted by the Engineer in writing.
- B. All products shall be in current production with no notice having been given that such product is to be drastically changed, modified, or discontinued from production.
- C. The supplier, by submitting, certifies that equipment being processed is proper for the application intended and that it has the capacity specified.
- D. Lead-Free Requirements:
  - 1. Any product designed for dispensing potable water must meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
  - 2. This requirement supersedes specific model numbers stated either in these specifications or on the drawings, should a non lead-free model number be used for products designed for dispensing potable water.

# 2.2 COMPLETE SYSTEM

A. All products, materials and accessories shall be furnished and installed as required for a complete system ready for Owner's beneficial use.

# 2.3 PRODUCTS, MECHANICAL WORK

- A. General: Refer to Division 1 sections for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to mechanical work:
- B. Compatibility: Provide products which are compatible with other products of the mechanical work, and with other work requiring interface with the mechanical work. Provide products with the proper or correct power characteristics, fuel-burning characteristics and similar adaption's for the project. Coordinate the selections from among options (if any) for compatibility of products.
- C. Equipment and Material Deviations: When any material or piece of equipment is specified on the plans or in the specification by reference to one manufacturer's name or model number, it is intended to establish the required standard of design and quality, and it is understood that the phrase "or approved equal" is hereby inserted following the one manufacturer's name, whether such phrase occurs or not.
- D. When the drawings and/or specifications indicate one or two manufacturer's names for materials and equipment, the bidder may submit his bid based on material or equipment of manufacturers not named but considered by the bidder to be equal to the standard of quality and design specified. However, such substitutions must be accepted by the Engineer as equal. If the bidder elects to bid on a substitution without obtaining the written consent of the Engineer prior to receipt of bids, then it will be understood that proof of compliance with specified requirements is the direct responsibility of the bidder and no such materials and/or equipment may be purchased or installed without written acceptance of the Engineer.
- E. Bidders are advised to ascertain such acceptance from their suppliers by requesting copies of the acceptance in writing, signed by the Engineer. Bidders are also advised to submit a stamped, self-addressed envelope when requesting said copies.

# 2.4 ELECTRICAL PROVISIONS OF MECHANICAL WORK

- A. All electrical work required in association with the HVAC work (in order to provide complete operating systems of Fire Suppression, Plumbing, HVAC and HVAC controls) shall generally be a part of the Division 26 work. However, there are certain portions of the electrical requirements which shall be a responsibility of the Division 23 work, which shall be executed in accordance with applicable Division 26 Specification requirements. The electrical provisions of mechanical work, where it may be furnished integrally with mechanical work, can be summarized (but not by way of limitation) to include the following: 1) Motors, 2) Motor starters, 3) Wiring from mechanical equipment to electrical work termination (junction box or disconnect switch), 4) Control switch, pilot lights, interlocks, control transformers and similar devices, 5) Variable Frequency/Variable Speed Drives, 6) Electrical heating coils and similar elements in mechanical equipment, 7) Electrical work specified as mechanical work in the HVAC control system, 8) Drip pans to protect electrical work, and 9) Work specified elsewhere and/or in other sections as part of the Mechanical Work Requirements.
- B. Responsibility: It is the sole responsibility of the Contractor to coordinate the electrical requirements of each item of equipment provided with the electrical circuits required and to insure their compatibility and compliance with the N.E.C.
- C. For the purposes of these Specifications, the term "single point power connection" (SPPC) shall mean explicitly that. A single point power connection shall require no other circuits to complete the system. If an item of equipment is provided which is scheduled and/or specified for SPPC but requires additional circuits, the Contractor shall be responsible for the additional circuits, transformers, circuit protection, sub-fusing, etc. in accordance with the NEC and/or the Division 16 specifications for this project.
- D. If such an instance occurs where an item of equipment, heat trace, control element, etc., is shown or required, and no electrical provisions are elsewhere specified, shown or indicated, the Contractor shall provide a properly sized and protected power circuit for it (them) as part of the Division 15 work in accordance with the Division 26 sections of these specifications and the N.E.C.
- E. If such an instance occurs where the electrical characteristics of an item of equipment indicated in/on Mechanical Drawings do not match those indicated in/on the Electrical Drawings, it shall be considered as a drafting inconsistency and the Contractor shall be required to provide equipment which is properly matched to the circuits and circuit protection provided.
- F. Where mechanical devices are to be incorporated into fabricated electrical units at the factory, furnish devices to the designated factory well in advance of time that the units are needed at the project.
- G. Where control transformers are provided, insure that they are compatible with the electrical circuits provided (example: if a 480volt/3phase/60 hz, 3-wire power circuit serves a mechanical item of equipment, provide 480 volt to low voltage transformer(s) for controls, if low voltage controls so require, not 277 volt transformers).
- H. Standards: Where not otherwise indicated, comply with applicable provisions of the National Electrical Code, NEMA standards, and sections of Division 16 of these specifications. All wiring, including controls, shall be installed in conduit with wire sizes according to NFPA 70 unless otherwise indicated on the plans.

# I. Starters/Switches:

- Manufacturer: Allen-Bradley, Cerus, Furnas, Cutler-Hammer, General Electric, or Westinghouse.
- 2. Motor starters shall be sized in accordance with the National Electrical Code and proper heater elements shall be provided and installed. Match AIC Rating of Electrical Panels serving the motor starter, 30K AIC minimum.
- 3. Starter Characteristics: Type I general purpose enclosure with padlock ears and supports for mounting as indicated. Starter type and size as recommended by motor manufacturer. Locate disconnect switch within sight of motor.

- 4. Manual Switches: Provide on motors 1/3 hp and smaller, except where automatic control or interlock is indicated; include pilot light. Provide overload protection where not protected by panelboard circuit breaker or fused disconnect switch.
- 5. Magnetic Starters: Provide for 1/2 hp and larger motors, and for smaller motors on automatic control or with interlock switch.
- 6. Starters shall consist of a horsepower rated magnetic contactor with a minimum of 1NO and 1NC auxiliary contacts and solid state electronic overload relay. Overload relay shall protect all three phases with a wide range current setting and trip class to allow field adjustment for specific motor FLA. Interchangeable heater elements are not acceptable. Overload relay shall provide phase failure, phase loss, locked rotor and stall protection.
- 7. Provide a manual reset pushbutton on the starter cover to restore normal operation after a trip or fault condition.
- 8. Each starter shall include an installed 50VA control power transformer (CPT) with protected secondary. The CPT must accept the available line voltage and the control voltage shall not exceed 120V.
- Installed accessories shall include Hand-Off-Auto operation switch with 22mm style operator interfaces. Include LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions. All pilot devices shall be water tight and dust tight.
- 10. When remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals including 24VAC, 120VAC, 24VDC and 48VDC to allow direct connection of the transistorized automation signal to the starter.
- 11. In applications where the motor is interlocked with a damper or valve, the actuator control must reside within the starter enclosure. The starter must provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position.
- 12. The starter shall provide a provision for Fireman's Override operation. When activated, the starter run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. The purpose of the Fireman's Override input is to act as a smoke purge function. Fireman's Override has priority over the Emergency Shutdown input.
- 13. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto.
- 14. Boiler Rooms: Provide manually operated remote emergency shut-down switches, fully in accordance with ASME CDS-1-2009, for all boilers, and for all water heaters in excess of 200,000 btu (58 kw) fuel or power input or over 120 gallon water storage. Switches shall be located on the outside of the boiler room next to the room door, or just inside of the room door for rooms having doors opening to the building exterior. Switch to be equal to Eaton 10250T5B62-S106, NEMA 4, 2 NC contacts

# J. Wiring/Connections:

- 1. Motors: Wire connections in flexible conduit, except where plug-in electrical cords are indicated and permitted by governing regulations.
- 2. General Wiring: Comply with applicable provisions of Division 16 sections.
- 3. Control wiring: This contractor is responsible for all line voltage control wiring required for interlocked valves, dampers and other control devices. Controls subcontractor is responsible for any and all low voltage control cable/wiring required for a complete and operational system. In general, Division 16 contractor will provide a single 120-volt circuit to the control panel.

#### K. Drip Pans:

1. Where possible to run mechanical piping elsewhere, do not run mechanical piping directly above electrical or electronic work which is sensitive to moisture; otherwise provide drip pans under mechanical piping, sufficient to protect electrical work from drips. Locate pan immediately below piping, and extend a minimum of 6" on each side of piping and lengthwise 18" beyond equipment being protected. Fabricate fans 2" deep, or reinforced sheet metal with rolled edged and soldered or welded seams; 20 gage copper, or 16 gauge steel with 2 oz. zinc finish hot dripped after fabrication. Provide 3/4" copper draining piping, properly discharged.

#### **PART 3 - EXECUTION**

#### 3.1 WORKMANSHIP

A. All work shall be performed by competent mechanics using proper tools and equipment to produce first quality work. All work shall be neatly installed, accessible for maintenance and complete with all accessories required.

# 3.2 ACCESSIBLE PROVISIONS

A. Thermostats shall be mounted at 54" above the floor where side reach is possible and at 48" where only forward reach as possible.

#### 3.3 ACCESS

- A. Access Units: The work of this article is limited to the provisions for access through other work for access to mechanical work, and does not include internal access provisions (within the mechanical work). In general and where possible, furnish or furnish-and-mount required access units in other trades' work prior to their work, so that cutting and patching for the subsequent installation of such access units will not be required. In occupied spaces, provide finished access units of the maximum concealment type, including locks where appropriate, and matching access units provided in the same expanse of finish (for non-mechanical access, if any). Access units shall meet the fire and/or smoke rating of the construction in which installed.
- B. Scope: The scope of access units to be furnished or provided as indicated on mechanical drawings or specified in Division 15 sections, and those additional units required for adequate access to mechanical work and not shown or specified individually.
- C. Access Doors: Standard welded-steel construction, 16 gauge frames and 14 gauge door panels, 175° concealed spring hinges, rust-inhibitive prime coat, flush cam lock (for screw-driver operation where keyed lock is not required). Ceiling Access Units: flush type with exposed flange, 16-gage door flush with frame, 24" x 24" unless noted otherwise, factory primed finish.

# 3.4 CUTTING AND PATCHING

A. Cutting and Patching Requirements: Comply with the requirements of other Divisions for the cutting and patching of other work to accommodate the installation of mechanical work. Except as individually authorized by the Engineer, cutting-and-patching of mechanical work to accommodate the installation of other work is not permitted, other than necessary penetrations of mechanical sheet metal work for electrical conduit and similar purposes.

# 3.5 FOUNDATIONS AND SPECIAL SUPPORTS

- A. Furnish and install all special foundations and supports required for equipment installed under this Section, unless they are a part of the building structure and are shown in other sections.
- B. All floor mounted shall be mounted on 4" minimum thick housekeeping pads which have are a minimum 4" higher than surrounding floor, grade, or surface and which are 6" larger in each plan dimension that the equipment installed thereon.

# 3.6 CONCRETE FOR MECHANICAL WORK

A. General: The work of this article is defined to include whatever concrete work is necessary or shown specifically for installation of the mechanical work. Coordinate the work with other work, particularly other concrete work and accessories.

- B. General Standards: Except as otherwise indicated, comply with applicable provision of Division 3 Sections for mechanical-work concrete, including formwork, reinforcement, mix design, material (use mix designs and materials accepted for Division-3 work where possible), admixtures, accessories (including waterstops), placing of wet concrete, finishing, curing, protecting, testing, submittals, and other requirements of the concrete work. Refer instances of uncertain applicability to the Engineer for resolution before proceeding.
- C. Associated Work: Where expansion joint fillers and sealants are required, provide the types indicated and comply with applicable provisions of the other sections. Where a moisture or vapor barrier is indicated, under or behind concrete work, provide fiber-reinforced, plastic-core, asphalt-saturated felt-laminate sheets, 1/8" thick, 70 lbs. per 100 sq. ft., 0.005 perm rating.
- D. Classes and Applications: Except as otherwise indicated, provide strength classes as follows, with the following cement content and water/cement ratios (for the indicated applications and similar required applications):
  - 1. 4000 psi Class: 565 lbs. cement/yd. (6.0 sacks); 0.57 water/cement ratio. Provide 4000 Class for tanks, vaults, beam-type foundations and similar structures.
  - 2. 3000 psi Class: 500 lbs. cement/yd. (5.25 sacks); 0.68 water/cement ratio. Provide 3000 Class for miscellaneous underground structural concrete, reinforced encasement, block-type foundations (with smallest dimension at least 0.2 x largest dimension), curbs, pads, inertia blocks (unframed type), and similar structural support work, and whenever otherwise unspecified or not indicated by class.
  - 3. 2500 psi Class: 450 lbs. cement/yd. (4.75 sacks); 0.75 water/cement ratio. Provide 2500 Class for plain encasement, filling steel-framed units, and similar work.
  - 4. Rough Grouting Class: 565 lbs. cement/yd (6.0 sacks); 0.75 water/cement ratio; adjust aggregate sizes to facilitate placement. Use for rough grouting, not for setting equipment bases.
  - 5. Backfill Class (Lean Concrete): 375 lbs. cement/yd. (4.0 sacks); 0.87 water/cement ratio. Use for backfilling where piping is installed in trenches below grade.

# 3.7 NOISE AND VIBRATION

A. Install vibration isolators, flexible connectors, expansion joints and other safety measures to prevent noise and vibration from being transmitted to occupied areas. Equipment shall be selected to operate within the noise level recommended for the particular type installation in relation to its location. After installation, make proper adjustments to eliminate excessive noise and vibration.

#### 3.8 CLEANING AND PATCHING

- A. Thoroughly clean all equipment and remove all trash, cartons, etc...Make any necessary corrections or repair/replace any damaged materials or equipment. Leave the entire system in a thoroughly clean and orderly manner.
- B. Any finished surfaces that have been scratched or discolored shall be touched-up or repainted to match the original color.
- C. All metal items subject to rusting, inside or exposed to the weather, shall be given one coat of proper type rust preventive type primer as soon as installed. If final paint finish is not specified in other sections, then this contractor shall apply two (2) finish coats with color to be selected by the Engineer.

# 3.9 MECHANICAL WORK CLOSE-OUT

A. General: Refer to the Division I sections for general closeout requirements. Maintain a daily log of operational data on mechanical equipment and systems through the closeout period.

- B. Record Drawings: Provide marked-up record drawings of the Mechanical work, give special attention to the complete and accurate recording of underground piping and ductwork, other concealed and non-accessible work, branching arrangement and valve location for piping systems, locations of dampers and coils in duct systems, locations of control system sensors and other control devices, and work of change orders where not shown accurately by contract documents.
- C. Closeout Equipment/Systems Operation: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration (with the Engineer present, and with the Owner's operating personnel present), to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.
- D. Operating Instructions: Conduct a full-day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of mechanical equipment and systems. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar features of the systems. This seminar to be scheduled ten days in advance. The entire seminar shall be recorded in standard format video cassette. Provide cassette with close-out documents.
- E. Turn-over of Operation: At the time of substantial completion, turn over the prime responsibility for operation of the mechanical equipment and systems to the Owner's operating personnel. However, until the time of final acceptance, provide one full-time operating technician who is completely familiar with the work, to consult with and continue training the Owner's personnel.
- F. Provide bound maintenance manual to consist of:
  - 1. Table of Contents
  - 2. Letter of Guarantee on Letterhead
  - 3. For each major item of equipment
  - 4. Operating instructions
  - 5. Maintenance instructions
  - 6. Parts lists
  - 7. Equipment performance
  - 8. Control diagrams with parts lists.
  - 9. Operating Instructions
- G. Bound manual shall be used during training of the Owner's personnel (manual must be submitted to Engineer and approved prior to such training).

#### **END OF SECTION 230100**

#### SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

#### **PART 1 - GENERAL**

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

# 1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

#### **PART 2 - PRODUCTS**

#### 2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

## 2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

# 2.3 POLYPHASE MOTORS

- A. Temperature Rise: Match insulation rating.
- B. Insulation: Class F.
- C. Code Letter Designation:
  - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
  - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

# 2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

# 2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - PART 3 EXECUTION (NOT APPLICABLE) END OF SECTION 230513

# SECTION 230920 - TEMPERATURE CONTROL SYSTEM (TCS) AND FACILITY MANAGEMENT CONTROL SYSTEM (FMCS)

# PART 1 GENERAL

#### 1.1 SUMMARY

A. Network Area Controller (NAC) shall be connected to customer's intranet and shall be supported by existing Honeywell central server located at Construction and Facility Management Office, AANG Headquarters, Montgomery, Alabama.

# 1.2 SYSTEM DESCRIPTION

- A. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark/LonTalk and/or BACnet communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be manufactured by Honeywell. Equivalent products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal.
- B. The Facility Management and Control System (FMCS) shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to the owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to LonMark/LonTalk (IDC), BACnet (IBC), MODBUS controllers and other open protocol systems/devices provided under other divisions.
- C. The Facility Management and Control System (FMCS) as provided in this Division shall be based on the Honeywell WEBS-AX Platform Version that is currently operating on the WEB-Supervisor or a newer version of the system incorporating the Niagara Framework™.
- D. The DDC/BMS/EMCS Controls Contractor shall contact the AANG CFMO for the current Honeywell/Niagara BMS software version information before commencing work covered under this contract and specification. The DDC/BMS/EMCS Controls Contractor shall provide all necessary Honeywell/Niagara software licenses and license upgrades for a period of One year from the date of final acceptance of this project. The DDC/BMS/EMCS Controls Contractor shall provide a software license maintenance agreement for the Honeywell software for a period of One year from the date of final acceptance for this project.

# 1.3 GENERAL

A. All control components shall be compliant with Honeywell/Niagara WEBS-AX and meet the requirements of this specification. Equivalent products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal. Systems not developed on the Niagara Framework platform are unacceptable. B. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package.

#### 1.4 AGENCY AND CODE APPROVALS

- A. All products of the TCS and FMCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
  - 1. UL-916; Energy Management Systems
  - 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"
  - 3. CE
  - 4. FCC, Part 15, Subpart J, Class A Computing Devices

#### 1.5 SOFTWARE LICENSE AGREEMENT

A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

# PART 2 MATERIALS

#### 2.1 GENERAL

- A. The Temperature Control System (TCS) and Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein. All systems and software within FMCS shall be supported by compliance documentation from the manufacturer.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

# 2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet, LonWorks technology, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to

assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.

- C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
  - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
  - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

# 2.3 NETWORKS

- A. The Local Area Network (LAN) shall be a 10/100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.
- B. Local area network minimum physical and media access requirements:
  - 1. Ethernet; IEEE standard 802.3
  - 2. Cable; 100 Base-T, UTP-8 wire, category 5
  - 3. Minimum throughput; 100 Mbps.

#### 2.4 NETWORK ACCESS

- A. Remote Access.
  - For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

# 2.5 NETWORK AREA CONTROLLER (NAC)

- A. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
  - 1. Calendar functions
  - 2. Scheduling
  - 3. Trending
  - 4. Alarm monitoring and routing
  - 5. Time synchronization
  - 6. Integration of LonWorks, BACnet and MODBUS controller data.
  - 7. Network Management functions for all LonWorks and BACnet based devices
- B. The Network Area Controller must provide the following hardware features as a minimum:
  - 1. Honeywell WEB-8000 (equivalent or greater)
  - 2. Licensed for Honeywell WEBs-AX v3.8 and WEBs-N4
  - 3. 3 year software maintenance agreement
  - 4. Two Ethernet Ports 10/100 Mbps
  - 5. Wi-Fi capability. 802.11a/b/g/n
  - 6. One LonWorks FTT-10A Interface Port
  - 7. Two RS-485 ports. RS-485 ports shall be configurable for BACnet MSTP or Modbus RTU
  - 8. Micro-SD memory card for station backup
  - 9. Flash memory for long term data backup
  - 10. 8GB (min) Type A USB memory stick provided for backup. Memory stick is to remain in JACE enclosure after installation.
  - 11. Dedicated 24 VAC transformer for power. Wall-wart power supplies are not acceptable.
  - 12. External Battery Backup UPS (Uninterruptable Power Supply)
  - 13. The NAC must be capable of operation over a temperature range of -20 to 60°C
  - 14. The NAC must be capable of storage temperature range of -40 and 85°F
  - 15. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.
  - 16. The NAC shall be provided with a minimum of 25% capacity for devices and points above the installed capacity for future expansion.
- C. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- E. Event Alarm Notification and actions

- 1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
- The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
- 3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
  - a. To alarm
  - b. Return to normal
  - c. To fault
- 4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
- 5. Provide timed (schedule) routing of alarms by class, object, group, or node.
- 6. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
- F. Control equipment and network failures shall be treated as alarms and annunciated.
- G. Alarms shall be annunciated in any of the following manners as defined by the user:
  - 1. Screen message text
  - 2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
    - a. Day of week
    - b. Time of day
    - c. Recipient
  - 3. Pagers via paging services that initiate a page on receipt of email message
  - 4. Graphic with flashing alarm object(s)
  - 5. Printed message, routed directly to a dedicated alarm printer
- H. The following shall be recorded by the NAC for each alarm (at a minimum):
  - 1. Time and date
  - 2. Location (building, floor, zone, office number, etc.)
  - 3. Equipment (air handler #, accessway, etc.)
  - 4. Acknowledge time, date, and user who issued acknowledgement.
  - 5. Number of occurrences since last acknowledgement.
- I. Alarm actions may be initiated by user defined programmable objects created for that purpose.
- J. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
- K. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

- L. Provide a "query" feature to allow review of specific alarms by user defined parameters.
- M. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
- N. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

# 2.6 DATABASE BACKUP AND STORAGE

- A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
- B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
- C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

# 2.7 INTEROPERABLE DIGITAL CONTROLLER (IDC)

- A. Controls shall be Honeywell Spyder™ microprocessor based Interoperable LonWorks or BACnet Controllers (IDC) or approved equal. Where possible, all Interoperable Digital Controllers shall bear the applicable LonMark™ or BACnet interoperability logo on each product delivered.
- B. HVAC control shall be accomplished using LonMark™ based devices where the application has a LonMark profile defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device. Publicly available specifications for the Applications Programming Interface (API) must be provided for each LonWorks / LonMark controller defining the programming or setup of each device. This contractor shall provide all programming, documentation and programming tools necessary to set up and configure the supplied devices per the specified sequences of operation. Where BACnet based devices provide superior functionality for the task, BACnet may be used.
- C. This contractor shall run the communication network trunks to the nearest Network Area Controller (NAC). Coordinate locations of the NAC to ensure that maximum network wiring distances, as specified by the industry standard wiring guidelines, are not exceeded. All communications networks must be installed according to industry standard guidelines and use the appropriate trunk termination and bias devices. All LonWorks and LonMark devices must be supplied using FTT-10A LonWorks communications transceivers. The Network Area Controller (NAC) will provide all scheduling, alarming, trending, and network management for the LonMark / LonWorks based devices.
- D. The IDCs shall communicate with the NAC at a baud rate of not less than 78.8K baud. The IDC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- E. All IDCs shall be fully application programmable and shall at all times maintain their LONMARK certification, if so certified. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

F. The system architecture shall utilize the capabilities of the IDC's for all critical control functions such that a failure of the Network Area Controller (NAC) will not compromise the operation of the system and shall allow the system to default to an occupied mode of operation.

#### 2.8 GRAPHICAL USER INTERFACE SOFTWARE

- A. Operating System:
  - 1. The GUI shall run on Microsoft Windows 7 Professional or greater.
- B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
- C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
  - Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
  - 2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
  - 3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
  - 4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
    - a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    - b. Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.
  - 5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
  - 6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
- D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
  - 1. Create, delete or modify control strategies.
  - 2. Add/delete objects to the system.
  - 3. Tune control loops through the adjustment of control loop parameters.

- 4. Enable or disable control strategies.
- 5. Generate hard copy records or control strategies on a printer.
- 6. Select points to be alarmed and define the alarm state.
- 7. Select points to be trended over a period of time and initiate the recording of values automatically.

# 2.9 WEB BROWSER CLIENTS

- A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
  - User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
  - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
  - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
  - 4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
  - 5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
  - 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
    - b. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    - c. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

- d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
- e. View logs and charts
- f. View and acknowledge alarms
- g. Setup and execute SQL queries on log and archive information
- 7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
- 8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

# 2.10 SERVER FUNCTIONS AND HARDWARE

- A. The existing central server, located at the Construction & Facility Management Office, AANG Headquarters, Montgomery, Alabama shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.
- B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
- C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
- D. The server shall provide the following functions, at a minimum:
  - 1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
  - 2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
  - 3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
  - 4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
  - The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
  - 6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
  - 7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.

- 8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
- 9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
  - 1. Routing of alarms to display, printer, email and pagers
  - 2. View and acknowledge alarms
  - 3. Query alarm logs based on user-defined parameters
- 10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
  - 1. Viewing and printing log data
  - 2. Exporting log data to other software applications
  - 3. Query log data based on user-defined parameters

## 2.11 SYSTEM PROGRAMMING

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.
- B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

# C. Programming Methods

- 1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
- 2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
- 3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis

- of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
- 4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
- 5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

#### 2.12 LonWorks SYSTEM INTEGRATION

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as "binding". Systems requiring the use of third party LonWorks network management tools shall not be accepted.
- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

# 2.13 BACnet SYSTEM INTEGRATION

- A. The Network Area Controller shall support the integration of device data from BACnet MSTP, and/or BACnet Ethernet/IP control system devices. The connection to the BACnet system shall be via an RS-485, or Ethernet/IP as required by the device.
- B. The FMCS supplier shall provide a BACnet system communications driver. The equipment system vendor that provided the equipment utilizing BACnet shall provide documentation of the system's BACnet interface and shall provide factory support at no charge during system commissioning as required for a successful integration.

#### 2.14 MODBUS SYSTEM INTEGRATION

A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via RS-485, or Ethernet/IP as required by the device.

- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
  - Read/Write Modbus Al Registers
  - 2. Read/Write Modbus AO Registers
  - 3. Read/Write Modbus BI Registers
  - 4. Read/Write Modbus BO Registers
- C. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.
- D. The FMCS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning as required for a successful integration.

#### 2.14 OTHER CONTROL SYSTEM HARDWARE

- A. Space Temperature/Humidity Wall Module. Wall Module shall be Honeywell TR-71H communicating Wall Module or equivalent, unless specified otherwise.
  - 1. Wall module shall have an LCD display and user push button controls. Where specified, the wall module shall be installed under a locking cover with UL 916 listing designed for mounting on a standard electrical switch box.
  - 2. Space temperature sensors shall be accurate to plus or minus one F degree.
  - 3. Space humidity sensors shall have a sensing range of 5% to 95%.
  - 4. Where specified, the wall module shall have a relative setpoint adjustment for warmercooler adjustments
  - 5. Where specified, wall module shall also have an after-hours override pushbutton and override indicator.
- B. Duct Mount, Pipe Mount and Outside Air Temperature Sensors: Temperature sensors with an accuracy of +/- 0.3° F. Temperature sensors shall be Honeywell or equivalent.
  - 6. Outside air sensors shall include an integral sun shield.
  - 7. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
  - 8. Multipoint averaging element sensors where specified shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
  - 9. Pipe mount sensors shall have copper, or stainless steel separable wells.
- C. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. All electrical devices within a control panel shall be factory wired. All external wiring shall be connected to terminal strips mounted within the panel. Provide engraved phenolic nameplates identifying panel function on the face of control panels. For control panels powered by dedicated electrical circuits the panel labels shall indicate the electrical panel number and circuit breaker number of the circuit supplying power to the panel.

Panel labels shall match ID tags on the As-Built drawings. Panel labels shall be mechanically affixed with stainless screws or pop-rivets. Provide power surge protection for the panel using devices designed and approved for the purpose. A complete set of plastic laminated As-Built control drawings (relating to the controls within that panel) shall be furnished within each control panel.

#### PART 3 EXECUTION

# 3.1 INSTALLATION

- A. All work described in this section shall be performed by system integrators or contractors that have a successful history in the design and installation of integrated control systems. The installing office shall have a minimum of five years of integration experience and shall provide documentation in the submittal package verifying the company's experience.
- B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- C. Drawings of the TCS and FMCS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.
- D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.
- E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by this contractor.
- F. Commissioning Interface (CxGUI): The system shall include a basic WEB based GUI interface programmed into the Network Area Controller (NAC) to be used during system acceptance, commissioning and test and balancing. The CxGUI shall be able to be accessed via direct or network connection to the NAC using a web browser and shall be available to the agents performing the system testing/acceptance. The CxGUI shall display and have access to any and all control points as specified in the project plans and specifications and any other points necessary for system acceptance testing in a graphical grid format. It shall be possible to print or save the results of the acceptance testing to digital files, the data displayed by the CxGUI. These files and printouts shall be included as part of the project closeout documentation.

# 3.2 WIRING

- A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be the responsibility of the this contractor.
- B. The electrical contractor (Div. 16) shall furnish all power wiring to electrical starters and motors.
- C. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 16) unless otherwise allowed by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

- D. All control cables shall be labeled on each end of the cable with printed labels of either heat-shrink tubing, flags or self-laminating cable wraps. Labels shall match the tag ID's on the As-Built drawings.
- E. All HVAC control devices, new and existing, shall be labeled with approved printed adhesive labels. The labels shall match the ID tags on the As-Built drawings.

# 3.3 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of final system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

#### 3.4 ACCEPTANCE TESTING

- A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. This contractor shall perform tests to verify proper performance of components, routines, and points. Tests shall be repeated until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. This contractor shall perform QA/QC tests on the LonWorks, BACnet, Modbus and other networks using a digital storage oscilloscope (DSO) to determine proper network operation. These tests shall be documented by printouts and digital files from the DSO.
- D. This contractor shall provide, as part of the closeout documentation, all QA/QC test and verification documentation and logs required by this specification.

# 3.5 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the TCS and FMCS hardware and software has been established this contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. This contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the TCS and FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

# PART 4 SEQUENCES OF OPERATION

# 4.1 SUMMARY

A. This contractor shall coordinate control functions, such as scheduling and supervisory level global control, points list, and control sequences needed for this installation as listed below. Contractor shall provide written documentation as required to archive the system operation as accepted by the owner.

**END OF SECTION 230920** 

# SECTION 23 09 23.16 – GAS INSTRUMENTS PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section Includes the Following Gas Instruments:
  - 1. Carbon monoxide sensors and alarm panel
- B. Related Requirements:
- 1. Section 230920 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

## 1.3 DEFINITIONS

A. NDIR: Nondispersive infrared.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
  - Operating characteristics, electrical characteristics, and furnished accessories indicating
    process operating range, accuracy over range, control signal over range, default control
    signal with loss of power, calibration data specific to each unique application, electrical
    power requirements, and limitations of ambient operating environment, including
    temperature and humidity.
  - 2. Installation instructions, including factor affecting performance
  - 3. Product description with complete technical data, performance curves, product specification sheets.

# 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gas instruments to include in operation and maintenance manuals.

# **PART 2 - PRODUCTS**

# 2.1 CARBON-MONOXIDE MONITORING SYSTEM

- A. Description:
  - 1. Each sampling point shall monitor any variation in the carbon-monoxide and nitrous oxide concentration level.
  - 2. Each sampling point shall be individually piped to the monitoring system.
  - 3. Provide each sampling g point with a 0.3-micron filter.
  - 4. Each sampling point shall be an alarm point.
  - A dual-head diaphragm pump shall draw an air sample through piping system and through a microprocessor-controlled sequencer feeding an analyzer with a new sample every 15 seconds.
  - 6. Sample time shall be adjustable in 1 second increments from zero to 60 minutes.
  - 7. Span and zero calibration gas shall be automatically initiated by the microprocessor. System shall also provide manual initiation of span and zero calibration gas.
  - 8. Analyzer output shall be corrected by the microprocessor.
  - 9. Monitoring system shall have 8 sample points.
  - 10. System shall operate on 120-V ac, single-phase, 60-Hz power.
  - 11. Final adjustment, calibration, testing, and startup of the system shall be performed by a trained representative manufacturer.

#### B. Analyzer:

- 1. Analyzer shall operate using principle of nondispersive infrared absorption.
- 2. Sampling response time shall be within 10 seconds.
- 3. Zero drift and span drift shall be less than 1 percent of full scale within a 24-hour period.

- 4. Repeatability shall be within 1 percent of full scale.
- 5. Accuracy shall be within 1 percent of full scale.
- 6. Accuracy shall be within 1 percent of full scale
- 7. Calibration range shall be zero to 100 PPM for CO, 0-3 PPM for NO2.
- 8. Digital display on analyzer face with scale shall be in ppm.
- 9. Temperature shall be compensated from 30 to 120 deg F ambient temperature.
- 10. Basis Armstrong monitoring AMC-1222

# C. Control and Display:

- 1. Each sample shall send a 4-20mA output signal proportional to the highest concentration.
- 2. Alphanumeric visual display of current analyzer concentration reading shall be in ppm or another industry-accepted measurement.
- 3. Visual indication for sample analyzing sample high-concentration alarm, analyzer, malfunction, and calibration.
- 4. Any number and configuration of sample points shall be capable of being bypassed.
- 5. Each sample point shall be capable of being manually sampled through an override feature.
- 6. System parameters shall be stored in nonvolatile memory.
- 7. Provide at least an eight-hour battery backup of current alarm status. Battery shall be rechargeable.

#### D. Enclosure:

- 1. NEMA 250, Type 1.
- 2. Hinged and locking door, full size of face.
- 3. House all systems components. Multiple adjoining enclosures are acceptable if joined to a common support structure.

#### **PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
- C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy more stringent of all requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Properly support instruments, tubing, piping, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to seismic loads.
- D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

# 3.3 INSTRUMENTS, GENERAL INSTALLATION REQUIREMENTS

- A. Mounting Location:
  - 1. Install transmitters for gas associated with individual air-handling units and associated connected ductwork and piping near air-handlings units co-located in air-handling unit

- system control panel, to provide service personnel a single and convenient location for inspection and service.
- 2. Install gas switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
- 3. Mount switches and transmitters not required to be mounted within system control panels on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

# B. Mounting Height:

- Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
- 2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code, state, and federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.
  - a. Make every effort to mount at 60 inches.
- C. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated, using neoprene gaskets or grommets.
- D. CO sensors to be installed 4 to 5 feet above floor. Cable from sensor to monitor to be shielded 3-conduvor instrument cable, installed in conduit.

# 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install engraved phenolic nameplate with instrument identification on face.

#### 3.5 CHECKOUT PROCEDURES

- A. Check out installed products before continuity tests, leak tests, and calibration.
- B. Check instruments for proper location and accessibility.
- C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that impact performance.
- D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.

# 3.6 ADJUSTMENT, CALIBRATION, AND TESTING

## A. Description:

- Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
- 2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
- 3. For each analog instrument, perform a three-point calibration test for both linearity and accuracy.
- 4. Equipment and procedures used for calibration shall comply with instrument manufacturer's written recommendations.
- 5. Provide diagnostic and test equipment for calibration and adjustment.
- 6. Field instruments and equipment used to test and calibrate installed instruments shall have an accuracy of at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with accuracy of 0.35 percent.
- Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

- 8. If, after calibration, indicated performance cannot be achieved, replace out-of-tolerance instruments.
- 9. Comply with field-testing requirements and procedures in ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.
- B. Switches: Calibrate switches to make or break contact at set points indicated.
- C. Transmitters:
  - 1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
  - 2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

# 3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain, instrumentation and control devices.

# **END OF SECTION 23 09 23.16**

## **SECTION 233113 - METAL DUCTS**

#### **PART 1 GENERAL**

#### 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Single-wall rectangular ducts and fittings.
  - 2. Single-wall round ducts and fittings.
  - 3. Sheet metal materials.
  - 4. Sealant and gaskets.
  - 5. Hangers and supports.
- B. Related Sections:
  - 1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
  - Section 233300 "Air Duct Accessories" for dampers, sound-control devices, ductmounting access doors and panels, turning vanes, and flexible ducts.

# 1.3 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
  - 1. Liners and adhesives.
  - Sealants and gaskets.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel," for hangers and supports.
  - 2. AWS D1.2/D1.2M, "Structural Welding Code Aluminum," for aluminum supports.
  - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 "HVAC System Construction and Insulation."

#### **PART 2 - PRODUCTS**

#### 2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."

- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, ductsupport intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards -Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."

# 2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eastern Sheet Metal.
    - b. United-McGill AirFlow LLC.
    - c. SEMCO Incorporated.
    - d. Sheet Metal Connectors, Inc.
    - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
  - Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
  - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

#### 2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
  - 3. Finishes for Surfaces to be field painted shall be suitable for field painting.

- C. Aluminum Sheets: Comply with ASTM B209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

#### 2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
  - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  - 2. Tape Width: 3 inches.
  - 3. Sealant: Modified styrene acrylic.
  - 4. Water resistant.
  - 5. Mold and mildew resistant.
  - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  - 7. Service: Indoor and outdoor.
  - 8. Service Temperature: Minus 40 to plus 200 deg F.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Solvent-Based Joint and Seam Sealant:
  - 1. Application Method: Brush on.
  - 2. Base: Synthetic rubber resin.
  - 3. Solvent: Toluene and heptane.
  - 4. Solids Content: Minimum 60 percent.
  - 5. Shore A Hardness: Minimum 60.
  - 6. Water resistant.
  - 7. Mold and mildew resistant.
  - 8. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  - 9. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
  - 10. Service: Indoor or outdoor.
  - 11. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
  - 1. General: Single-component, acid-curing, silicone, elastomeric.
  - 2. Type: S.
  - 3. Grade: NS.
  - 4. Class: 25.
  - 5. Use: O.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

# 2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
  - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

#### **PART 3 - EXECUTION**

# 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

# 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

## 3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in the General Notes on the plans according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

#### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

# 3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

# 3.6 PAINTING

A. Ductwork exposed to view in occupied spaces (excluding mechanical rooms) at the locations as indicated on the plans shall be painted. Paint materials and application requirements are specified in Section 099123 "Interior Painting."

#### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
  - Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
  - 2. Test the following systems:
    - a. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
  - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - 4. Test for leaks before applying external insulation.

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- 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
- 6. Give seven days' advance notice for testing.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

# 3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

# **END OF SECTION 233113**

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#### **SECTION 233300 - AIR DUCT ACCESSORIES**

# **PART 1 - GENERAL**

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manual volume dampers.
  - 2. Fire dampers.
  - 3. Turning vanes.
  - 4. Duct-mounted access doors.
  - 5. Flexible connectors.
  - 6. Duct accessory hardware.
- B. Related Requirements:
  - 1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
  - 2. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

# 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

 A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

#### **PART 2 - PRODUCTS**

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

# 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.

- 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

# 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
    - a. Flexmaster U.S.A., Inc.
    - b. McGill AirFlow LLC.
    - c. Nailor Industries Inc.
    - d. Ruskin Company.
  - 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

#### 5.Blades:

- a. Multiple or single blade.
- b. Parallel- or opposed-blade design.
- c. Stiffen damper blades for stability.
- d. Galvanized-steel, 0.064 inch thick.
- 6. Blade Axles: Galvanized steel.
- 7. Bearings:
  - a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
  - 1. Size: 0.5-inch diameter.
  - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - Length and Number of Mountings: As required to connect linkage of each damper in multipledamper assembly.
- C. Damper Hardware:
  - a. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
  - 2. Include center hole to suit damper operating-rod size.

#### 2.4 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Nailor Industries Inc.
  - 3. Ruskin Company.

- A. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- C. Fire Rating: Refer to Architectural Life Safety plans, and providing rating as required for wall to which the damper is installed.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
  - 1. Minimum Thickness: 0.05 thick, as indicated, and of length to suit application.
  - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.024-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- H. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

# 2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Aero-Dyne Sound Control Co.
  - 2. Ductmate Industries, Inc.
  - 3. Duro Dyne Inc.
  - 4. Hardcast, Inc.
  - 5. SEMCO LLC.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

# 2.6 DUCT-MOUNTED ACCESS DOORS

- A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors Round Duct."
  - 1.Door:
    - a. Double wall, rectangular.
    - Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.

- b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
- c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches.
- d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

#### 2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. Hardcast, Inc.
  - 4. Ventfabrics, Inc.
  - 5. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd..
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: 24 oz./sq. yd..
  - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  - 3. Service Temperature: Minus 50 to plus 250 deg F.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.

- H. Install duct security bars. Construct duct security bars from 0.164-inchsteel sleeve, continuously welded at all joints and 1/2-inch- diameter steel bars, 6 inches o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch hinged access panel with cam lock in duct in each side of sleeve.
- I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  - 2. Elsewhere as indicated, refer to Metal Ducts section for access panels required for Grease Ductwork.
- J. Install access doors with swing against duct static pressure.
- K. Access Door Sizes:
  - 1.12 by 12 inches minimum.
- L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- M. Install flexible connectors to connect ducts to equipment.
- N. Install duct test holes where required for testing and balancing purposes.
- O. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

# 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
  - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  - 4. Inspect turning vanes for proper and secure installation.

# **END OF SECTION 233300**

#### **SECTION 233346 - FLEXIBLE DUCTS**

#### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Insulated flexible ducts.

# 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

## 1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

#### **PART 2 - PRODUCTS**

#### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

# 2.2 INSULATED FLEXIBLE DUCTS

- A. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
  - 1. Flexmaster U.S.A., Inc.
  - 2. Flex-Tek Group.
  - 3. McGill AirFlow LLC.
  - 4. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
  - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.
  - 3. Temperature Range: Minus 20 to plus 210 deg F.
  - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

# 2.3 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

23 33 46 FLEXIBLE DUCTS

#### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- D. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- E. Install duct test holes where required for testing and balancing purposes.
- F. Installation:
  - 1. Install ducts fully extended.
  - 2. Do not bend ducts across sharp corners.
  - 3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
  - 4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
  - 5. Install flexible ducts in a direct line, without sags, twists, or turns.
- G. Supporting Flexible Ducts:
  - 1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
  - 2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
  - 3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions. <u>Ducts may not</u> rest on ceilings or any other item other than joists or structural supports.
  - 4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

# **END OF SECTION 233346**

23 33 46 FLEXIBLE DUCTS

## **SECTION 233414 - DE-STRATIFICATION FANS**

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section includes:
  - Large diameter multiblade de-stratification fans.

# 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, furnished specialties, and accessories for each fan.
  - 2. Certified fan performance curves with system operating conditions indicated.
  - 3. Certified fan sound-power ratings.
  - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 5. Material thickness and finishes, including color charts.
  - 6. Fan speed controllers.

# 1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For axial fans to include in emergency, operation, and maintenance manuals.

# **PART 2 - PRODUCTS**

# 2.1 MANUFACTURER

- A. Delta T Corporation, dba Big Ass Fans.
- B. MicroAir Fans

# 2.2 HIGH VOLUME, LOW SPEED FANS

- A. Complete Unit:
  - The entire fan assembly shall be ETL certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2. The fan shall be designed to move an effective amount of air for cooling and destratification in large industrial applications over an extended life. The fan and components shall be designed

specifically for high volume, low speed fans to ensure lower operational noise. The sound levels from the fan operating at maximum speed shall not exceed 55 dBA (measured 20' or 6.1 m below the blades and 20' or 6.1 m horizontally from the center of the fan). Basis: – BIG ASS FANS POWERFOIL X2.0 MODEL.

# B. Airfoil System

- 1. The fan shall be equipped with ten (10) Powerfoil airfoils of precision extruded aluminum aloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers. As an option, airfoils may be powder coated as specified by the architect or owner.
- 2. The fan shall be equipped with ten (10) Powerfoil winglets on the end of the airfoils and ten (10) AirFences™ positioned on the airfoils at the optimum location for performance. AirFences are fixed aerodynamic devices applied along the airfoil to break up the air and redirect the fan's air velocity profile, contributing to a 28% improvement in coverage area. The winglets and AirFences shall be molded of ABS plastic. The standard color of the winglets and AirFences shall be "Safety Yellow".

#### C. Motor:

1. The fan motor shall be an AC induction type inverter rated at 1725 RPM, 230/460 VAC, and 60 Hz for 3 φ and 1725 RPM, 208 VAC, and 60 Hz for 1 φ. The motor shall be totally enclosed, fan cooled (TEFC) with an IP42 NEMA classification. NEMA standard frames 56C shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in -30oF to 122oF (-34oC to 50oC) ambient conditions. As an option, motor may be colored as specified by the architect or owner.

## D. Gearbox:

- 1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X2.0. The gearbox shall include a high efficiency, hermetically sealed, nitrogen filled, offset helical gear reducer with two stage gearing, a 2-1/2" (6.4 cm) hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low foaming synthetic oil with extreme pressure additives and a wide temperature range.
- 2. The fan gearbox shall be equipped with a hollow shaft in which wiring, piping, etc can be routed below the fan. A non-rotating, junction box shall be provided at the base of the fan for installing optional features such as lights or cameras. The inclusion of the hollow shaft and non-rotating junction box must be specified at the time of order. As an option, gearbox may be colored as specified by the architect or owner.

# E. Mounting Post:

1. The fan shall be equipped with a no critical weld design, mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be 3" x 3" (7.6 cm x 7.6 cm) and powder coated for corrosion resistance and appearance. Mounting post to be colored as specified by the contracting officer.

## F. Hub:

1. The fan hub shall be made of laser cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, ten (10) aluminum spars and one (1)

aluminum spacer fastened with a pin and collar rivet system. The hub shall be secured to the output shaft of the gearbox by means of a steel flange interface. The hub shall incorporate five (5) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

# G. Mounting System:

1. The fan mounting system shall be designed for quick and secure installation from a structural support beam. The mounting bracket shall be of welded construction using low carbon steel no less than 3/16" (0.5 cm) thick and be powder coated for appearance and resistance to corrosion. All mounting bolts shall be SAE Grade 8 or equivalent. The mounting bracket may be colored as specified by the contracting officer.

# H. Safety Cable:

- 1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be 3/8" to 1/4" diameter and fabricated out of 7 x 19 stranded galvanized steel. The loops shall be secured with swaged Nicopress sleeves, pre-loaded and tested to 3,200 lb·f (13,345 N).
- 2. Field construction of safety cables is not permitted.

#### I. Controller:

1. The onboard, fan controller shall be constructed using a Variable Speed Drive (VSD) that is pre-wired to the motor and factory programmed to minimize the starting and braking torques, for smooth and efficient operation. The controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). An incoming power cord shall also be pre-wired to the controller with an NEMA L5-20P twist-lock plug and 15-ft cord for ease of installation.

# J. Wall Control:

- The fan shall be equipped with a wall mounted keypad or wall control providing 100% control of all fan functions. The wall control shall be a digital keypad device mounted within a cast zinc cover. The cover shall be capable of mounting to a standard wall box utilizing a supplied adapter plate. The wall control shall be equipped with touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. Communication with the fan VSD and wall control shall be by a standard CAT-5 (or higher) ethernet cable. The wall control comes standard with 150-ft of factory-assembled CAT5 ethernet cable.
- 2. The wall control shall be equipped with a simple diagnostic program to identify faults in the system. Provisions must be made for retrieving fan operation and diagnostic data (fault messages) through the remote wall device.

# K. Fire Control Panel Integration

1. Powerfoil® X2.0 shall include a standard, power-on shutdown fire relay for seamless fire-control panel integration. The fire relay can be wired on or off in the field.

# L. Warranty:

1. The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges within the

USA, F.O.B. Lexington, KY), pursuant to the complete terms and conditions of the Big Ass Fans Non-Prorated Warranty in accordance to the following schedule:

Airfoils	Lifetime (Parts)	Controller	15 years (Parts)
Hub	Lifetime (Parts)	All other fan components	15 years (Parts)
Motor	15 years (Parts)	Labor	1 year
Gearbox	15 years (Parts)		

#### **PART 3 - EXECUTION**

# 3.1 INSTALLATION

- A. Install fans level and plumb.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Equipment Mounting: Anchor to existing structure, follow manufacturer's instructions.
- E. Install units with clearances for service and maintenance.

# 3.2 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

# 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Prepare test inspection reports.

# **END OF SECTION 233414**

#### **SECTION 233423 - HVAC POWER VENTILATORS**

#### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Centrifugal roof ventilators, down blast
  - 2. Tailpipe exhaust fan and hose reel assembly

# 1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

# 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material thickness and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
  - Roof curbs.
  - 7. Fan speed controllers.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For fan supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
  - Wind- Restraint Details: Detail fabrication and attachment of wind restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

#### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set(s) for each belt-driven unit.

#### 1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

#### 1.8 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

# **PART 2 - PRODUCTS**

# 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer in the State of Alabama, to design mounting and restraints for equipment, including comprehensive engineering analysis.
  - 1. Design equipment supports to comply with wind performance requirements.
- B. Wind-Restraint Performance:
  - 1. Basic Wind Speed: 120 mph.
  - 2. Building Classification Category: III.
  - 3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
- C. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."

#### 2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Subject to compliance with the plans and specifications, provide products by one of the following:
  - 1. Cook
  - 2. Greenheck
  - 3. Penn
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
  - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
  - 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
  - 1. Resiliently mounted to housing.
  - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
  - 5. Fan and motor isolated from exhaust airstream.

#### E. Accessories:

- 1. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
- 2. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; double wall with 1" thick insulation; Size as required to suit roof opening and fan base.
  - 1. Configuration: Self-flashing without a cant strip, with mounting flange.
  - 2. Metal Liner: Galvanized steel.
  - 3.

#### 2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

#### 2.4 SOURCE QUALITY CONTROL

A. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

# 2.5 EXTRACTION ARM UTILITY SET FANS

#### A. Description:

 Factory-fabricated, -assembled, -tested, and -finished, direct-driven centrifugal fan utility vent sets, consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.

# B. Housings:

- 1. Housing Material: Reinforced steel.
- 2. Housing Coating: Powder-baked enamel.
- 3. Formed panels to make curved-scroll housings with shaped cutoff.
- 4. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
- 5. Discharge Arrangement: Fan scroll housing field rotatable to any of [seven] [eight] discharge positions. Provide fan with discharge positioned in proper direction to minimize connected duct turns.

#### C. Wheels:

- 1. Wheel Configuration: SWSI, with hub keyed to shaft.
- 2. Wheel and Blade Materials: Steel.
- 3. Wheel and Blade Coating: None
- 4. Backward-Inclined Airfoil Blades:
  - a. Aerodynamic design.
  - b. Heavy backplate.

- Hollow die-formed, airfoil-shaped blades continuously welded at tip flange and backplate.
- 5. Backward-Inclined Curved Blades:
  - a. Curved design.
  - b. Heavy backplate.
  - c. Single-thickness blades continuously welded at tip flange and backplate.

# D. Shafts:

1. Turned, ground, and polished steel; keyed to wheel hub. First critical speed at least 1.4 times maximum class speed.

# E. Bearings:

- 1. Heavy-duty regreasable ball or roller type in a cast iron pillowblock housing.
- 2. Ball-Bearing Rating Life: ABMA 9, L(50) of 200,000 hours.
- 3. Extend grease fitting to accessible location outside of unit.
- F. Motor Enclosure: Open, dripproof.
- G. Accessories:
  - 1. Inlet and Outlet: Flanged.
  - 2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
  - 3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades, with felt edges in steel frame installed on fan discharge.
  - 4. Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
- H. Hose Reel Assembly: Fabricated from powder coated steel with structural steel parallel tubing for attachment; guide bar for proper storage of reel, diameter as shown on plans, storage capacity for 25-feet, drum rotation using dual tempered steel springs with ratchet lock, chrome plated steel spring loaded damper type tailpipe attachment.

#### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.
- C. Install units with clearances for service and maintenance.
- D. Label units.

# 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.

# 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Adjust belt tension.
  - 6. Adjust damper linkages for proper damper operation.
  - 7. Verify lubrication for bearings and other moving parts.
  - 8. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

# 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

## **END OF SECTION 233423**

#### **SECTION 235123 - GAS VENTS**

# **PART 1 - GENERAL**

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Listed double-wall vents.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Sample Warranty: For special warranty.

# 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel," for hangers and supports.
  - 2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents
- B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

# **PART 2 - PRODUCTS**

# 2.1 LISTED TYPE B AND BW VENTS

- A. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F (248 deg C) continuously for Type B or 550 deg F (288 deg C) continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211.
- B. Construction: Inner shell and outer jacket separated by at least a 1/4-inch (6-mm) airspace.
- C. Inner Shell: [ASTM B209 (ASTM B209M), Type 1100 aluminum] [ASTM B209 (ASTM B209M), Type 3003 aluminum] [ASTM B209 (ASTM B209M), Type 3105 aluminum] [ASTM A666, Type 430 stainless steel].
- D. Outer Jacket: [Galvanized] [Aluminized] steel.
- E. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
  - 1. Termination: Stack cap designed to exclude minimum 90 percent of rainfall.

#### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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# 3.2 APPLICATION

- A. Listed Type B and BW Vents: Vents for certified gas appliances.
- B. Listed Type L Vent: Vents for low-heat appliances.
- C. Listed Special Gas Vent: Condensing gas appliances.

# 3.3 INSTALLATION OF LISTED VENTS

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."
- B. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- C. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- D. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- E. Lap joints in direction of flow.

#### 3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

# **END OF SECTION 235123**

23 51 23 GAS VENTS

# SECTION 235523.16 - LOW-INTENSITY, GAS-FIRED, RADIANT HEATERS

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Gas-fired, infrared heaters.

# 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Signed, sealed, and prepared by or under the supervision of a qualified professional engineer.
  - 2. Include plans, elevations, sections, and mounting attachment details.
  - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 4. Detail fabrication and assembly of high-intensity, gas-fired, radiant heaters, as well as procedures and diagrams.
  - 5. Include diagrams for power, signal, and control wiring.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Structural members to which equipment will be attached.
  - 2. Gas piping to heater installations
  - 3. Thermostats and wiring to heaters.
  - 4. Heater locations and clearance requirements.
  - Other suspended ceiling components:
    - a. Lighting fixtures.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's special warranties.

# 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gas-fired, radiant heaters to include in emergency, operation, and maintenance manuals.

# 1.6 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of radiant heaters that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: All warranty periods listed below are from date of Substantial Completion.
    - a. Combustion and Radiant tubes: Five years.

- b. Burner Box components: Three years.
- c. Burner: 10 years.

# **PART 2 - PRODUCTS**

# 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ANSI Z83.26/CSA 2.37.
  - 1. CSA certified, with CSA Seal and certification number clearly visible on units.
  - 2. UL listed and labeled, with UL label clearly visible on units.
  - 3. Outdoor approved per ANSI Z83.26.
- B. 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.

# 2.2 GAS-FIRED, TUBULAR INFRARED HEATERS

- A. Subject to compliance with the plans and specifications, provide products by one of the following:
  - 1. Detroit Radiant
  - 2. Reverberray (Basis of Design)
  - 3. Schwank
  - 4. Space Ray
  - 5. Sterling
- B. Factory-assembled, outdoor, overhead-mounted, electrically controlled, high-intensity, tubular, infrared, radiant heating units using gas combustion. Heater to have all necessary factory-installed wiring and piping required prior to field installation and startup. Heater to be CSA Design certified for outdoor applications.
- C. Fuel Type: Natural Gas.
- D. Burner: Aluminized-steel venturi burner.
- E. Burner control box:
  - 1. Sight glass for burner inspection.
  - 2. Totally enclosed components.
  - 3. Silicone sealed, black enameled steel control housing.
  - 4. Stainless Steel cover.
  - 5. Operational indicator lights.
- F. Combustion and Radiant Tubes:
  - 1. 16 gauge 4" OD aluminized coated steel combustion chamber and radiant emitter tubes.
  - 2. All tubes coated with high temperature, corrosion resistant black coating, 0.95 emissivity.
- G. Emitter: Perforated ceramic tiles.
- H. Reflector: Polished aluminum.
- I. Ignition:
  - 1. Hot surface silicon carbide capable of temperatures achieving 2400F. Igniter shall be readily accessible and serviceable without the use of tools. Spark ignition shall not be permitted.
- J. Accessories:
  - 1. Hanger chain with "S" hooks.
  - 2. Mounting Bracket assembly.
  - 3. Preassembled chain suspension kit.
  - 4. Tie down points for sway bracing.
  - 5. Clearance warning plaque.
  - 6. Stainless steel flexible gas hose:
    - a. 24" long 304 Stainless Steel Gas Connector hose formed into a smooth C-Shape shall be used for final connections to units.

K. Mounting Angle: 0 degree mounting angle.

# 2.3 CONTROLS AND SAFETIES

- A. Failure Safeguards: 100 percent main gas shutoff on pilot or power failure.
- B. Control Transformer: Integrally mounted.

#### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine structures, substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances, required clearances, and other conditions affecting performance of the Work.
- B. Examine roughing-in for fuel-gas piping to verify actual locations of piping connections before equipment installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Equipment Mounting: Install gas-fired, infrared heaters with continuous-thread hanger rods and spring hangers of size required to support weight of heaters.
  - 1. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Equipment Installation: Install gas-fired, radiant heaters and associated gas features and systems according to NFPA 54.
- C. Suspended Units: Suspend from substrate using chain hanger kits and building attachments.
- D. Maintain manufacturers' recommended clearances for combustibles.

#### 3.3 CONNECTIONS

- A. Gas Piping: Comply with Section 231123 "Facility Natural-Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
  - 1. Gas Connections: Connect gas piping to radiant heaters according to NFPA 54.
    - Final connection shall be made per Manufacturers requirements. Refer to IOM for equipment.
    - b. Units to have shut off valve, ground joist union, and sediment trap.
- B. Where installing piping adjacent to gas-fired, radiant heaters, allow space for service and maintenance. DO NOT ROUTE ANY GAS PIPING OVER TOP OF UNIT HOUSING.
- C. Electrical Connections: Comply with applicable requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
  - 1. Install electrical devices furnished with heaters but not specified to be factory mounted.
  - 2. Do not route any wiring over top of unit housing.

# 3.4 ADJUSTING

- A. Adjust initial-temperature set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

# 3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

- 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- 2. Verify bearing lubrication.
- 3. Verify proper motor rotation.
- 4. Test Reports: Prepare a written report to record the following:
  - a. Test procedures used.
  - b. Test results that comply with requirements.
  - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Gas-fired, radiant heaters will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

# **END OF SECTION 235523.16**

#### **SECTION 26 05 19**

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

# **PART 1 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. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
  - 1. Section 26 05 23 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.
  - 2. Section 27 05 33 "Raceways, Boxes, and Cabling for Communications Systems" for twisted pair cabling used for data circuits.

# 1.03 DEFINITIONS

A. VFC: Variable frequency controller.

#### 1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

# 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

#### PART 2 PRODUCTS

#### 2.01 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpha Wire Company.
  - 2. Belden Inc.
  - 3. Cerro Wire LLC.
  - 4. Cooper Industries, Inc.
  - 5. Encore Wire Corporation.
  - 6. General Cable Technologies Corporation.
  - 7. General Cable; General Cable Corporation.
  - 8. Senator Wire & Cable Company.
  - 9. Service Wire Co.
  - 10. Southwire Company.
  - 11. Thomas & Betts Corporation, A Member of the ABB Group.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Conductors and cables shall be in accordance with NEMA, UL, as specified herein, and as shown on the drawings.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 and Type SO.
- D. VFC Cable:
  - 1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.

#### 2.02 CONNECTORS AND SPLICES

- A. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
  - 1. 3M.
  - 2. AFC Cable Systems, Inc.
  - 3. Gardner Bender.
  - 4. Hubbell Power Systems, Inc.
  - 5. Ideal Industries, Inc.
  - 6. ILSCO.
  - 7. NSi Industries LLC.
  - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 9. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Splices shall be in accordance with NEC and UL.
- C. Above Ground Splices for No. 10 AWG and Smaller:
  - 1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
  - 2. The integral insulator shall have a skirt to completely cover the stripped conductors.
  - 3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.
- D. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:
  - 1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
  - 2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
  - 3. Splice and insulation shall be product of the same manufacturer.
  - 4. All bolts, nuts, and washers used with splices shall be zinc-plated steel.
- E. Above Ground Splices for 250 kcmil and Larger:
  - 1. Long barrel "butt-splice" or "sleeve" type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
  - 2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
  - 3. Splice and insulation shall be product of the same manufacturer.

#### 2.03 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

# PART 3 EXECUTION

# 3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

# 3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- H. VFC Output Circuits: Type TC-ER cable with braided shield.

# 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

#### 3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Splice conductors only in outlet boxes, junction boxes, pullboxes, or handholes.
- D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

#### 3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

#### 3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

#### 3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 00 "Firestopping."

# 3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
    - Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    - b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.
- D. Test and Inspection Reports: Prepare a written report to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Cables will be considered defective if they do not pass tests and inspections.

# **END OF SECTION**

#### **SECTION 26 05 23**

# CONTROL-VOLTAGE ELECTRICAL POWER CABLES

# **PART 1 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. UTP cabling.
  - 2. RS-485 cabling.
  - 3. Low-voltage control cabling.
  - 4. Control-circuit conductors.
  - 5. Identification products.
  - 6. Backboards.

#### 1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
- D. RCDD: Registered Communications Distribution Designer.
- E. UTP: Unshielded twisted pair.

# 1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

# 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

# 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

# PART 2 PRODUCTS

## 2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

# 2.02 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
  - 1. Flame Travel Distance: 60 inches (1520 mm) or less.
  - 2. Peak Optical Smoke Density: 0.5 or less.
  - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

#### 2.03 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).
- B. Painting: Paint plywood on all sides and edges with flat Gray paint. Comply with requirements in Section 09 90 00 "Painting and Coating."

# 2.04 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. 3M.
  - 2. ADC.
  - 3. Alpha Wire Company.
  - 4. AMP NETCONNECT; a Tyco Electronics brand; a TE Connectivity Ltd. company.
  - 5. Belden CDT Networking Division/NORDX.
  - 6. Berk-Tek; a Nexans company.
  - 7. CommScope, Inc.
  - 8. Draka USA.
  - 9. General Cable; General Cable Corporation.
  - 10. Genesis Cable Products; Honeywell International, Inc.
  - 11. KRONE Incorporated.
  - 12. Mohawk; a division of Belden Networking, Inc.
  - 13. Nexans.
  - 14. Siemon.
  - 15. Siemon Co. (The).
  - 16. Superior Essex Inc.
  - 17. SYSTIMAX Solutions; a CommScope Inc. brand.
  - B. Description: 100-ohm, four-pair UTP, 24-pair UTP, formed into four-pair binder groups with no overall jacket.
    - 1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
    - 2. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
    - 3. Comply with TIA-568-C.1 for performance specifications.
    - 4. Comply with TIA-568-C.2, Category 6A.
    - 5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NFPA 70 for the following types:
      - a. Communications, Plenum Rated: Type CMP complying with UL 1685.
      - b. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

# 2.05 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. ADC.
  - 2. American Technology Systems Industries, Inc.
  - AMP NETCONNECT; a Tyco Electronics brand; a TE Connectivity Ltd. company.
  - 4. Belden CDT Networking Division/NORDX.
  - 5. Belden Inc.
  - 6. Corning Cable Systems.
  - 7. Dynacom Corporation.
  - 8. Hubbell Incorporated; Wiring Device-Kellems.
  - 9. Hubbell Premise Wiring.
  - 10. KRONE Incorporated.
  - 11. Leviton Manufacturing Co., Inc.

- 12. Molex Premise Networks.
- 13. Panduit Corp.
- 14. Siemon Co. (The).
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.
- F. Workstation Outlets: Two-port-connector assemblies mounted in single faceplate.
- G. Faceplates:
  - Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26 "Wiring Devices."
  - Metal Faceplate: Stainless steel, complying with requirements in Section 26 27 26 "Wiring Devices."
  - For use with snap-in jacks accommodating any combination of UTP, optical-fiber, and coaxial work area cords.
    - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.

# H. Legend:

- 1. Factory labeled by silk-screening or engraving for stainless steel faceplates.
- 2. Machine printed, in the field, using adhesive-tape label.
- 3. Snap-in, clear-label covers and machine-printed paper inserts.

# 2.06 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CMG.
  - 1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.
  - 1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. Fluorinated ethylene propylene insulation.
  - 3. Unshielded.
  - 4. Fluorinated ethylene propylene jacket.
  - Flame Resistance: NFPA 262.

# 2.07 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
  - 1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
  - 1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.

- 4. PVC jacket.
- 5. Flame Resistance: Comply with NFPA 262.

#### 2.08 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Encore Wire Corporation.
  - 2. General Cable; General Cable Corporation.
  - 3. Service Wire Co.
  - 4. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- C. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.
- E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
  - 1. Smoke control signaling and control circuits.

#### 2.09 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables according to TIA-568-C.2.
- C. Factory test optical-fiber cables according to TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

# **PART 3 EXECUTION**

# 3.01 EXAMINATION

- A. Test cables on receipt at Project site.
  - 1. Test each pair of UTP cable for open and short circuits.

# 3.02 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
  - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
  - 2. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
  - Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard if entering the room from overhead.
  - 4. Extend conduits 3 inches (75 mm) above finished floor.
  - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

#### 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C Series of standards.
  - 2. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  - 3. Cables may not be spliced.
  - 4. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
  - 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
  - 8. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
  - 9. Support: Do not allow cables to lay on removable ceiling tiles.
  - 10. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
  - 1. Comply with TIA-568-C.2.
  - 2. Install termination hardware as required.
  - 3. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
  - 1. Install wiring in raceways. Comply with requirements specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- E. Separation from EMI Sources:
  - 1. Comply with BICSITDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
  - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches (305 mm).
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
  - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).

- c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches (305 mm).
- 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
  - Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches (1200 mm).
- 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

# 3.04 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

#### 3.05 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
  - 1. Class 1 remote-control and signal circuits; No 14 AWG.
  - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

# 3.06 FIRESTOPPING

- A. Comply with requirements in Section 07 84 00 "Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

## 3.07 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

# 3.08 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

# 3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
  - 1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

- 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
  - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

#### **SECTION 26 05 26**

## **GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

## **PART 1 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 grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
  - 1. Underground distribution grounding.
  - 2. Ground bonding common with lightning protection system.
  - 3. Foundation steel electrodes.

## 1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

# 1.04 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

## 1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
    - Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
      - Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.

# 1.06 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.
  - 2. Dossert; AFL Telecommunications LLC.
  - 3. ERICO International Corporation.
  - 4. Fushi Copperweld Inc.
  - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
  - 6. Harger Lightning & Grounding.
  - 7. ILSCO.
  - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.

- 9. Robbins Lightning, Inc.
- 10. Siemens Power Transmission & Distribution, Inc.
- 11. Thomas & Betts Corporation, A Member of the ABB Group.

## 2.02 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

# 2.03 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

# 2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- E. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

## PART 3 EXECUTION

# 3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

# 3.02 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.

# 3.03 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

# 3.04 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

#### **SECTION 26 05 29**

#### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 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. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.

## 1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C.RMC: Rigid metal conduit.

# 1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C.Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D.Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

# 1.05 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.

# 1.06 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

## PART 2 PRODUCTS

# 2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. GS Metals Corp.

- f. G-Strut.
- g. Haydon Corporation.
- h. Metal Ties Innovation.
- i. Thomas & Betts Corporation, A Member of the ABB Group.
- j. Unistrut; an Atkore International company.
- k. Wesanco, Inc.
- Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA 4.
- 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
- Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-
- 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
  - 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. Allied Tube & Conduit; a part of Atkore International.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Fabco Plastics Wholesale Limited.
    - d. G-Strut.
    - e. Haydon Corporation.
    - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
  - 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
  - 3. Fitting and Accessory Materials: Same as channels and angles.
  - 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G.Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
  - 2) Empire Tool and Manufacturing Co., Inc.
  - 3) Hilti, Inc
  - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
  - 5) MKT Fastening, LLC.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

# 2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

# PART 3 EXECUTION

#### 3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

## 3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100

- mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
- 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
- 7. To Light Steel: Sheet metal screws.
- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

#### 3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

# 3.04 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 09 90 00 "Painting and Coating for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

#### **SECTION 26 05 33**

# RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

# **PART 1 - 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:
  - Metal conduits, tubing, and fittings.
  - 2. Metal wireways and auxiliary gutters.
  - 3. Boxes, enclosures, and cabinets.

# 1.03 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
  - 1. Structural members in paths of conduit groups with common supports.
  - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

## **PART 2 - PRODUCTS**

# 2.01 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Allied Tube & Conduit; a part of Atkore International.
  - 3. Anamet Electrical, Inc.
  - 4. Electri-Flex Company.
  - 5. FSR Inc.
  - 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 7. Patriot Aluminum Products, LLC.
  - 8. Picoma Industries, Inc.
  - 9. Republic Conduit.
  - 10. Robroy Industries.
  - 11. Southwire Company.
  - 12. Thomas & Betts Corporation, A Member of the ABB Group.
  - 13. Western Tube and Conduit Corporation.
  - 14. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - 1. Comply with NEMA RN 1.

- 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
  - 1. Fittings for EMT:
    - a. Material: die cast.
    - b. Type: compression.
  - 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

# 2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Anamet Electrical, Inc.
  - 3. Arnco Corporation.
  - CANTEX INC.
  - 5. CertainTeed Corporation.
  - 6. Condux International, Inc.
  - 7. Electri-Flex Company.
  - 8. Kraloy.
  - 9. Lamson & Sessions.
  - 10. Niedax Inc.
  - 11. RACO; Hubbell.
  - 12. Thomas & Betts Corporation, A Member of the ABB Group.
- B. LFNC: Comply with UL 1660.
- C. Fittings for LFNC: Comply with UL 514B.

# 2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. MonoSystems, Inc.
  - Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

## 2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Moulded Products, Inc.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. Lamson & Sessions.
  - Niedax Inc.
- B. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

## 2.05 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Adalet.
  - 2. Cooper Technologies Company.
  - 3. EGS/Appleton Electric.
  - 4. Erickson Electrical Equipment Company.
  - 5. FSR Inc.
  - 6. Hoffman; a brand of Pentair Equipment Protection.
  - 7. Hubbell Incorporated.
  - 8. Kralov.
  - 9. Milbank Manufacturing Co.
  - 10. MonoSystems, Inc.
  - 11. Oldcastle Enclosure Solutions.
  - 12. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 13. RACO; Hubbell.
  - 14. Robroy Industries.
  - 15. Spring City Electrical Manufacturing Company.
  - 16. Stahlin Non-Metallic Enclosures.
  - 17. Thomas & Betts Corporation, A Member of the ABB Group.
  - 18. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep.
- J. Gangable boxes are allowed.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.
  - Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

- L. Cabinets:
  - 1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## **PART 3 - EXECUTION**

# 3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - Exposed Conduit: GRC IMC.
  - 2. Concealed Conduit, Aboveground: GRC IMC EMT.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT or RNC.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
  - 3. Exposed and Subject to Severe Physical Damage: GRC IMC. Raceway locations include the following:
    - a. Equipment rooms.
    - b. Mechanical rooms.
    - c. Maintenance bays.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 6. Damp or Wet Locations: GRC.
  - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.
  - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

# 3.02 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches (300 mm)of enclosures to which attached.
- I. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- R. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
  - Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- S. Expansion-Joint Fittings:
  - 1. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    - d. Attics: 135 deg F (75 deg C) temperature change.
  - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg

- C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
- 3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- X. Locate boxes so that cover or plate will not span different building finishes.
- Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- AA. Set metal floor boxes level and flush with finished floor surface.
- BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

#### 3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

## 3.04 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 00 "Firestopping."

# 3.05 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

#### **SECTION 260543**

# UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERALRELATED DOCUMENTS

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

# 1.2 SUMMARY

## A. Section Includes:

- 1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
- 2. Rigid nonmetallic duct.
- 3. Flexible nonmetallic duct.
- Duct accessories.

# 1.3 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

# C. Duct Bank:

- 1. Two or more ducts installed in parallel, with or without additional casing materials.
- 2. Multiple duct banks.
- D. RMC: Galvanized rigid metal (steel) conduit.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

# 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include duct-bank materials, including spacers and miscellaneous components.
  - 2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
  - 3. Include underground-line warning tape.
  - 4. Include warning planks.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
  - Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
  - 2. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Source quality-control reports.
- C. Field quality-control reports.

## 1.6 FIELD CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
  - 1. Notify Owner no fewer than 10 days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service Owner's written permission.

## PART 2 - PRODUCTS

## 2.1 METAL CONDUIT AND FITTINGS

- A. RMC: Comply with ANSI C80.1 and UL 6.
- B. Coated Steel Conduit: PVC-coated galvanized rigid conduit.
  - 1. Comply with NEMA RN 1.
  - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Allied Tube & Conduit; a part of Atkore International.
  - 3. Anamet Electrical, Inc.
  - 4. Electri-Flex Company.
  - 5. FSR Inc.
  - 6. O- /Gedney; a brand of Emerson Industrial Automation.
  - 7. Patriot Aluminum Products, LLC.
  - 8. Picoma Industries. Inc.
  - 9. Republic Conduit.
  - 10. Robroy Industries.
  - 11. Southwire Company.
  - 12. Thomas & Betts Corporation, A Member of the ABB Group.
  - 13. Western Tube and Conduit Corporation.
  - 14. Wheatland Tube Company.
- D. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

# 2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.

- 2. Anamet Electrical, Inc.
- 3. Arnco Corporation.
- 4. CANTEX INC.
- 5. CertainTeed Corporation.
- 6. Condux International, Inc.
- 7. Electri-Flex Company.
- 8. Kraloy.
- 9. Lamson & Sessions.
- 10. Niedax Inc.
- 11. RACO; Hubbell.
- 12. Thomas & Betts Corporation, A Member of the ABB Group.
- C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
- C. Concrete Warning Planks: Nominal 12 by 12 by 3 inches in size, manufactured from 6000-psi concrete.
  - 1. Color: Red dye added to concrete during batching.
  - 2. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

## PART 3 - EXECUTION

# 3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain and as approved by Architect.
- C. Clear and grub vegetation to be removed and protect vegetation to remain.

# 3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Feeders 600 V and Less: Type EPC-40-PVC RNC, concrete-encased unless otherwise indicated.

- B. Duct for Electrical Branch Circuits: Type EPC-80-PVC RNC, direct-buried unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths and Driveways: Type EPC-40 PVC RNC, encased in reinforced concrete.
- D. Stub-ups: Concrete-encased GRC.

## 3.3 EARTHWORK

A. Excavation, Backfill, cut and patch, and restoration: Comply with contract drawings.

# 3.4 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down and away from buildings and equipment.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches both horizontally and vertically, at other locations unless otherwise indicated.
  - 1. Duct shall have maximum of two 90-degree bends or the total of all bends shall be no more 180 degrees between pull points.
- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- H. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- I. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.
- J. Concrete-Encased Ducts and Duct Bank:

- 1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in the contract drawings for pipes less than 6 inches (150 mm) in nominal diameter.
- 2. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
- 3. Depth: Install so top of duct envelope is at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 36 inches (914 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
- 4. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
- 5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than **four** spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
- 6. Elbows: Use manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct run.
  - Couple RNC duct to GRC with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.
  - b. Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.
    - 1) Stub-ups shall be minimum 4 inches (100 mm) above finished floor and minimum 3 inches (75 mm) from conduit side to edge of slab.
  - c. Stub-ups to Indoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of wall. Install insulated grounding bushings on terminations at equipment.
    - 1) Stub-ups shall be minimum 4 inches (100 mm) above finished floor and no less than 3 inches (75 mm) from conduit side to edge of slab.
- 7. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
- 8. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
- 9. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between duct of like services, and 4 inches (100 mm) between power and communications ducts.

- 10. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
  - a. Start at one end and finish at the other, allowing for expansion and contraction of duct as its temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written instructions or use other specific measures to prevent expansion-contraction damage.
  - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
- 11. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.
- K. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried duct, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct or duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.
- L. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

# 3.5 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

# 3.6 FIELD UALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
  - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstru1.ctions and retest.

- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

# 3.7 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
  - 1. Sweep floor, removing dirt and debris.
  - 2. Remove foreign material.

## **SECTION 26 05 44**

# SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

# **PART 1 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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
- 2. Sleeve-seal systems.
- 3. Sleeve-seal fittings.
- Grout.
- 5. Silicone sealants.
- B. Related Requirements:
  - 1. Section 07 84 00 "Firestopping" for penetration firestopping installed in fire-resistancerated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

## 1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

# PART 2 PRODUCTS

# 2.01 SLEEVES

- A. Wall Sleeves:
  - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
  - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C.PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
  - 1. Material: Galvanized sheet steel.
  - 2. Minimum Metal Thickness:
    - For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

# 2.02 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. CALPICO, Inc.

- c. Metraflex Company (The).
- d. Pipeline Seal and Insulator, Inc.
- e. Proco Products. Inc.
- 2. Sealing Elements: EPDM 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.
- 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

# 2.03 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. HOLDRITE.

# **2.04 GROUT**

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-firerated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

# 2.05 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
  - 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

## PART 3 EXECUTION

# 3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
    - Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

- 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
  - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

# 3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

# 3.03 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

# SECTION 26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

# **PART 1 - 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. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Warning labels and signs.
  - 5. Instruction signs.
  - 6. Equipment identification labels.
  - 7. Miscellaneous identification products.

# 1.03 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

# 1.04 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

# 1.05 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

# **PART 2 - PRODUCTS**

# 2.01 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.

- C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
- G. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- H. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

# 2.02 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

## 2.03 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-

- resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F (93 deg C). Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

## 2.04 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

# 2.05 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
  - 1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
  - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
  - 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs:
  - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
  - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
  - 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

# 2.06 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

# 2.07 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

# 2.08 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  - Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one-piece, self-locking.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - Tensile Strength at 73 deg F ((23 deg C)), According to ASTM D 638: 7000 psi (48.2 MPa).
  - UL 94 Flame Rating: 94V-0.
  - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
  - 5. Color: Black.

## 2.09 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## **PART 3 - EXECUTION**

## 3.01 INSTALLATION

A. Verify identity of each item before installing identification products.

- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

# 3.02 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
    - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- D. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.
- E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  - 1. Comply with 29 CFR 1910.145.
  - 2. Identify system voltage with black letters on an orange background.
  - 3. Apply to exterior of door, cover, or other access.
  - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
- I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - Labeling Instructions:
    - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - e. Emergency system boxes and enclosures.
    - f. Enclosed switches.
    - g. Enclosed circuit breakers.
    - h. Enclosed controllers.
    - Variable-speed controllers.
    - i. Push-button stations.

k. Contactors.

# SECTION 26 09 23 LIGHTING CONTROL DEVICES

### **PART 1 - 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. Room Controllers.
  - 2. Power Packs.
  - 3. Occupancy Sensors.
  - 4. Daylight Sensors.
  - 5. Low Voltage Switches.
  - 6. Occupancy Sensor Couplers.
  - 7. Passive Infrared Sensors.
  - 8. Ultrasonic Sensors
  - 9. Dual Technology Sensors
  - 10. Outdoor Photoelectric Switches.
  - 11. Conductors and Cables.
- B. Related Requirements:
  - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

# 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Floor Plans: Location, orientation, and coverage area of each sensor; group designations; and other specific design symbols and designations as required to define the installation, location, and configuration of all control devices.
  - 2. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
    - c. Room Controllers.
    - d. Power Packs.
    - e. Low Voltage Switches.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Include diagrams for power, signal, and control wiring.

### 1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which equipment will be attached.
  - 3. Other items in the finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.

- e. Access panels.
- f. Control Modules.

### 1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

### B. WARRANTY

- a. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of lighting control software.
    - b. Faulty operation of lighting control devices.
  - 2. Warranty Period: Three year(s) from the start of the Owner's acceptance.

### PART 2 - PRODUCTS

### 2.0 DESCRIPTION

The system shall consist of Room Controllers, Power Packs, Occupancy Sensors, Occupancy Sensor Couplers, Daylight Sensors, and Low Voltage Switches.

# 2.1 ROOM CONTROLLERS

Room Controllers shall provide control capabilities for lighting zones. Zones are established for single areas or rooms as shown on the drawings. Room Controllers shall have the following characteristics:

- a. Characteristics:
  - 1) 120/277V, 60Hz, 20A Rating.
  - 2) (3) lighting zones with (3) 0-10V dimming outputs.
  - 3) Inputs for occupancy and daylight sensors using CAT5E cabling and RJ45 connections. Room controllers shall power up to (2) occupancy sensors without the need for additional Power Packs.
  - 4) Inputs for low voltage wall switches. Up to (4) low voltage switches can be connected per room controller.
  - 5) Outputs for Receptacle Power Packs using CAT5E cabling and RJ45 connections. Up to (5) Receptacle Power Packs can be connected to a single Room Controller.
  - 6) NEMA 1 and Plenum Rated.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Greengate Controls, Cooper Lighting.
  - 2) <u>NLIGHT Controls, Acuity Brands.</u>
  - 3) NX Controls, Hubble Lighting.

## 2.2 POWER PACKS

Power Packs provide low voltage power for additional Occupancy Sensors. Power Packs shall have the following characteristics:

- a. Characteristics:
  - 1) Input: 120V, 60Hz, 20A
  - 2) Output low voltage: 24VDC, 225mA.
  - 3) Powers up to (5) Occupancy Sensors.
  - 4) Constructed of plenum-rated, high-impact thermoplastic enclosure.

- 5) Directive 2011/65/EU. Restriction of Hazardous Substances (RoHS) compliant.
- 6) Utilizes zero-crossing circuitry to prevent damage from inrush current.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Greengate Controls, Cooper Lighting.
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

### 2.3 OCCUPANCY SENSORS

IEEE C62.41, NEMA WD 1, UL 94, UL 916, UL 508, ASTM D4674 REV A, NEMA WD 7. Provide occupancy/vacancy sensors with coverage patterns as indicated on manufacturer shop drawings. Provide no less quantity of sensors as shown on plans but add additional sensors when required to fulfill coverage requirement for the specific model of sensor provided. Provide sensor types as described in the sequence of operations. Sensor locations and quantities are shown in shop drawings provided by the lighting control system manufacturer. Provide vacancy sensor operation that requires manual control to activate luminaires and turns luminaires off after a set time of inactivity. Occupancy Sensors shall interface through the Room Controller. Provide ceiling or wall-mounted occupancy/vacancy sensors that meet the following requirements:

- a. Characteristics:
  - 1) Input: 24VDC, 60Hz.
  - 2) Interface with Room Controller VIA Occupancy Sensor Coupler with CAT5E cabling and RJ45 connections.
  - 3) Time delay of 30 seconds to 30 minutes with at least four intermediate time delay settings.
  - 4) Sensors are ceiling and wall mounted where indicated.
  - 5) Does not exceed a maximum number of (2) sensors connected to a single room controller. Additional sensors (3-5) will require a separate Power Pack to provide low voltage power.
  - 6) Shielded or controlled by internal logic to adjust sensitivity to avoid false triggering due to ambient temperature, air temperature variations or HVAC air movement.
  - 7) Occupancy and vacancy operation is field-adjustable and programmable with push-button or dip switch on the sensor device. Time Delay settings for 5, 15, or 30 minutes.
  - 8) No leakage current to load when in the off mode.
  - 9) Utilize zero-crossing circuitry to prevent damage from high inrush current and to promote long life operation.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Greengate Controls, Cooper Lighting.
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

### 2.4 DAYLIGHT SENSORS

Provide daylight sensors that shall have the following characteristics

a. Characteristics:

- 1) Input: 24VDC, 60Hz. Power provided from Room Controller.
- 2) Interface with Room Controller VIA CAT5E cabling and RJ45 connections.
- 3) Detect changes in ambient lighting level and enable dimming as required by sequence of operation by operating in an open loop system.
- 4) Contain a detection cone, where the base of the cone may be circular or an elongated shape, and where the smallest angle between the edge and the axis of the cone is between 20 and 50 degrees. The cone axis may be tilted to the vertical when installed to give the sensor preferred directionality.
- 5) Sensors are ceiling-mounted and wall-mounted where indicated with sensitivity, filtering, range and viewing angle to meet requirements of sequence of operation, scope of work and construction documents.
- 6) Time delay that is adjustable from 1 to 30 seconds ON delay, and 1 to 30 minutes OFF delay to prevent cycling, with deadband adjustment of 25 percent to 100 percent above lower setpoint.
- 7) Output dimming signal is linear to light level with less than 1 percent variation. Cadmium sulfide photo-resistors are not acceptable.
- 8) Sensor is not combined in the same housing or location with occupancy or vacancy sensors if the proper location for one function compromises the successful operation of the other function, or in any way reduces the system's ability to meet the design intent.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) <u>Greengate Controls, Cooper Lighting.</u>
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

# 2.5 LOW VOLTAGE SWITCHES

Low Voltage Switches provide room or area level switching of luminaires through interface with the Room Controller. Provide low voltage wall switches that shall have the following characteristics:

- a. Characteristics:
  - 1) Input: 24VDC, 60Hz. Power provided from Room Controller.
  - 2) Single Gang configuration. Device and wall plate color shall be as specified in 26 27 26.
  - 3) Interface with Room Controller VIA CAT5E cabling and (2) RJ45 connections.
  - 4) Switches shall be available in 2,3,4, and 5 programmable pushbutton configurations.
  - 5) Switches shall come with pre-defined functions cable of raising, lowering, and bringing luminaires on or off.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) <u>Greengate Controls, Cooper Lighting.</u>
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

### 2.6 OCCUPANCY SENSOR COUPLERS

Occupancy Sensor Couplers provide power to Occupancy Sensors through CAT5E cabling. Occupancy Sensor Couplers shall have the following characteristics:

- a. Characteristics:
  - 1) (2) RJ45 Ports
  - 2) (4) Low voltage power outputs for occupancy sensors.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) <u>Greengate Controls, Cooper Lighting.</u>
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

### 2.7 PASSIVE INFRARED SENSORS

Provide Passive Infrared Sensors (PIR) sensors that detect occupancy by sensing heat and movement in the area of coverage. Provide sensors that are constructed of a housing of high-impact, injection-molded thermoplastic. Provide PIR sensors that are temperature compensated, with a dual element sensor and a multi-element fresnel lens of POLY IR4 material.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) <u>Greengate Controls, Cooper Lighting.</u>
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

# 2.8 ULTRASONIC SENSORS

Provide ultrasonic sensors that detect occupancy by sensing a change in pattern of reflected ultrasonic waves in the area of coverage. Provide sensors that are constructed of a housing of high-impact, injection-molded thermoplastic. Provide ultrasonic sensors that operate at 40 kHz.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Greengate Controls, Cooper Lighting.
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

### 2.9 DUAL TECHNOLOGY SENSORS

Provide dual technology sensors that meet the requirements for PIR sensors and ultrasonic sensors indicated above. If either the PIR or ultrasonic sensing registers occupancy, the luminaires must remain on.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) <u>Greengate Controls, Cooper Lighting.</u>
  - 2) NLIGHT Controls, Acuity Brands.
  - 3) NX Controls, Hubble Lighting.

# 2.10 OUTDOOR PHOTOELECTRIC SWITCHES

Provide switches with solid state SPST dry contacts rated for 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps Sensors are based on networked addressable architecture and must be compatible with digital addressable lighting interface.

a. Characteristics:

- 1) Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 2) Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
- 3) Time Delay: Fifteen-second minimum, to prevent false operation.
- 4) Surge Protection: Metal-oxide varistor.
- 5) Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
- 6) Failure Mode: Luminaire stays ON.
- b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
  - 2) Hubbell Incorporated; Wiring Device-Kellems.
  - 3) <u>Leviton Manufacturing Co., Inc.</u>
  - 4) Pass & Seymour/Legrand (Pass & Seymour).

### 2.11 CONDUCTORS AND CABLES

- a. Power Wiring to Supply Side of Room Controllers: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables.
- b. Digital and Multiplexed Signal Cables: UTP cable with copper conductors, complying with Category 5e for horizontal copper cable and with Section 270533 "Raceways, Boxes, and Cabling for Communications Systems."

### 3.0 EXECUTION

# 1. EXAMINATION

- a. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- b. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.

# 2. SENSOR INSTALLATION

- a. Comply with NECA 1.
- b. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- c. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

# 3. CONTACTOR INSTALLATION

- a. Comply with NECA 1.
- b. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

### 4. WIRING INSTALLATION

- a. Comply with NECA 1.
- b. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and section 270533 "Raceways, Boxes, and Cabling for Communications Systems". Minimum conduit size is 1/2 inch (13 mm).
- c. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- d. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- e. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### 5. IDENTIFICATION

- a. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- b. Label time switches and contactors with a unique designation.

### 6. FIELD QUALITY CONTROL

- a. Perform the following tests and inspections:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- b. Lighting control devices will be considered defective if they do not pass tests and inspections.
- c. Prepare test and inspection reports.

### 7. DEMONSTRATION

- a. Demonstrate to the Owner how to operate each separate lighting control device mentioned in the product section above. Instruct the owner on how to troubleshoot and maintain the lighting control system.
- b. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

### END OF SECTION

# SECTION 26 24 16 PANELBOARDS

### PART 1 - 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. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.
  - 3. Disconnecting and Overcurrent Protective Devices

# 1.03 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

### 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
  - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 4. Detail bus configuration, current, and voltage ratings.
  - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 6. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 8. Include wiring diagrams for power, signal, and control wiring.

# 1.05 INFORMATIONAL SUBMITTALS

- A. ualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards.

# 1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
  - Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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# 1.07 QUALITY ASSURANCE

A. Manufacturer ualifications: ISO 9001 or 9002 certified.

# 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

### 1.09 FIELD CONDITIONS

- A. Environmental Limitations:
  - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    - b. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet (2000 m).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - Notify Owner no fewer than two days in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Owner's written permission.
  - 3. Comply with NFPA 70E.

### 1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months starting from date of Owner's acceptance.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.
  - 1. SPD Warranty Period: Five years starting from date of Owner's acceptance.

### **PART 2 - PRODUCTS**

# 2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. 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.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
  - 2. Height: 84 inches (2.13 m) maximum.

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- 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
- 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- 5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- 6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
- 7. Finishes:
  - Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
  - b. Back Boxes: Same finish as panels and trim.
  - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

### F. Incoming Mains:

- 1. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Terminations shall allow use of 75 deg C rated conductors without derating.
  - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  - 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
  - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  - Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

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### 2.02 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

# 2.03 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. ESL Power Systems, Inc.
  - 3. General Electric Company; GE Energy Management Electrical Distribution.
  - 4. Siemens Energy.
  - 5. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: As indicated on drawings.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.

### 2.04 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company; GE Energy Management Electrical Distribution.
  - 3. Siemens Energy.
  - Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with frontmounted, field-adjustable trip setting.
  - 3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Digital display of settings, trip targets, and indicated metering displays.
    - d. Multi-button keypad to access programmable functions and monitored data.
    - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    - f. Integral test jack for connection to portable test set or laptop computer.
    - g. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
      - 4) Ground-fault pickup level, time delay, and I squared T response.

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- 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1. RK-5.
- 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
- 6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
- Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, singlepole configuration.
- 8. Subfeed Circuit Breakers: Vertically mounted.
- 9. MCCB Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Breaker handle indicates tripped status.
  - c. UL listed for reverse connection without restrictive line or load ratings.
  - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
  - f. Shunt Trip: 24-V trip coil energized from separate circuit.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  - Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
  - 2. Fused Switch Features and Accessories:
    - a. Standard ampere ratings and number of poles.
    - b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.
    - c. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

# 2.05 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
  - Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  - Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

### 2.06 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

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# **PART 3 - EXECUTION**

# 3.01 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
  - Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.
- J. Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
  - Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.
- N. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- P. Mount spare fuse cabinet in accessible location.

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### 3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

### 3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
  - Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- D. Tests and Inspections:
  - Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    - c. Instruments and Equipment:
      - Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

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- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
  - 1. Measure loads during period of normal facility operations.
  - 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
  - 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

### 3.06 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION** 

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# SECTION 26 27 26 WIRING DEVICES

#### **PART 1 - 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. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Weather-resistant receptacles.
  - 3. Snap switches and wall-box dimmers.
  - 4. Solid-state fan speed controls.
  - 5. Wall-switches.

### 1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

# 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Cord and Plug Sets: Match equipment requirements.

# 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

### 1.06 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
  - 2. Hubbell Incorporated; Wiring Device-Kellems..
  - 3. Leviton Manufacturing Co., Inc.
  - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

### 2.02 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.

### 2.03 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Single piece, rivet less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

# 2.04 GFCI RECEPTACLES

- A. General Description:
  - 1. Straight blade, non-feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

#### 2.05 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

# 2.06 EQUIPMENT RECEPTACLE (50A)

- A. Single Convenience Receptacle, 250V, 3PH, 50 A: Comply with NEMA WD 1, NEMA WD 6 Configuration NEMA 15-50R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

# 2.07 EQUIPMENT RECEPTACLE (30A)

A. Single Convenience Receptacle, 250 V, 3PH, 30 A: Comply with NEMA WD 1, NEMA WD 6 Configuration NEMA 15-30R, and UL 498.

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- Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).

### 2.08 CORD AND PLUG SETS

- A. Description:
  - 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

### 2.09 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - Single Pole:
      - 1) Cooper; AH1221.
      - 2) Hubbell; HBL1221.
      - 3) Leviton; 1221-2.
      - 4) Pass & Seymour; CSB20AC1.
    - b. Two Pole:
      - 1) Cooper; AH1222.
      - 2) Hubbell; HBL1222.
      - 3) Leviton: 1222-2.
      - 4) Pass & Seymour; CSB20AC2.
    - c. Three Way:
      - 1) Cooper: AH1223.
      - 2) Hubbell; HBL1223.
      - 3) Leviton; 1223-2.
      - 4) Pass & Seymour; CSB20AC3.
- C. Pilot-Light Switches, 20 A:
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

# 2.10 FINISHES

- A. Device Color:
  - Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color.

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# **PART 3 - EXECUTION**

# 3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.

### C. Conductors:

- Do not strip insulation from conductors until right before they are spliced or terminated on devices
- 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
- 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- 4. Existing Conductors:
  - a. Cut back and pigtail or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

### D. Device Installation:

- 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
- 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
- 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
- 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
- 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
- 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
- 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
- 8. Tighten unused terminal screws on the device.
- 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

### E. Receptacle Orientation:

- 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

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### 3.02 IDENTIFICATION

- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

### 3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
  - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

**END OF SECTION** 

WIRING DEVICES 26 27 26 - 5

# SECTION 26 28 13 FUSES

### **PART 1 - 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. Cartridge fuses rated 600 V ac and less for use in the following:
    - a. Control circuits.
    - b. Enclosed controllers.
    - c. Enclosed switches.

#### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
  - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 3. Current-limitation curves for fuses with current-limiting characteristics.
  - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
  - 5. Coordination charts and tables and related data.
  - 6. Fuse sizes for elevator feeders and elevator disconnect switches.

## 1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
  - 1. Ambient temperature adjustment information.
  - 2. Current-limitation curves for fuses with current-limiting characteristics.
  - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project.
  - 4. Coordination charts and tables and related data.

### 1.05 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

### **PART 2 - PRODUCTS**

### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Bussmann; a division of Cooper Industries.
  - 2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
  - 3. Littelfuse, Inc.

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- 4. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

### 2.02 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  - 1. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
- B. 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.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.02 FUSE APPLICATIONS

- A. Cartridge Fuses:
  - 1. Feeders: Class RK5, time delay.
  - 2. Motor Branch Circuits: Class RK5, time delay.
  - 3. Large Motor Branch (601-4000 A): Class L, time delay.
  - 4. Control Transformer Circuits: Class CC, time delay, control transformer duty.
  - 5. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

### 3.03 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

### 3.04 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

### **END OF SECTION**

26 28 13 - 2 FUSES

#### **SECTION 26 28 16**

# **ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

### **PART 1 - GENERAL**

### 1.01 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.

### 1.02 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Molded-case circuit breakers (MCCBs).
  - 4. Enclosures.

### 1.03 DEFINITIONS

- NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

### 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of NRTL listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.

### 1.05 INFORMATIONAL SUBMITTALS

- A. ualification Data: For qualified testing agency.
- B. Field quality-control reports.
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - Results of failed tests and corrective action taken to achieve test results that comply with requirements.

## 1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
  - Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

### 1.07 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. 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.
- D. Comply with NFPA 70.

### 1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
  - 2. Altitude: Not exceeding 6600 feet (2010 m).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Owner's written permission.
  - 4. Comply with NFPA 70E.

### 1.09 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

# **PART 2 - PRODUCTS**

### 2.01 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company.
  - 3. Siemens Industry, Inc.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

- 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
- 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
- 4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
- 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
- 6. Lugs: Mechanical type, suitable for number, size, and conductor material.
- 7. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac.

### 2.02 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company.
  - 3. Siemens Industry, Inc.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
  - 4. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 5. Lugs: Mechanical type, suitable for number, size, and conductor material.

### 2.03 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Sector; Eaton Corporation.
  - 2. General Electric Company.
  - 3. Siemens Industry, Inc.
  - 4. Square D; by Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  - 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

# 2.04 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.

2. Outdoor Locations: NEMA 250, Type 3R.

### **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.02 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

# 3.03 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### 3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    - Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

# 3.05 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges.

# **END OF SECTION**

# SECTION 26 51 00 INTERIOR AND EXTERIOR LIGHTING

### **PART 1 - 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. Interior lighting fixtures, lamps, and Drivers.
  - 2. Emergency lighting units.
  - 3. Lighting fixture supports.

## 1.03 Related Requirements:

A. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, addressable luminaire controls, and multipole lighting relays and contactors.

### 1.04 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. LED: Light-emitting diode.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.

### 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of lighting fixture including dimensions.
  - 2. Emergency lighting units including battery and charger.
  - 3. Driver, including BF.
  - 4. Energy-efficiency data.
  - 5. Life, output (lumens, CCT, and CRI), and energy-efficiency.
  - 6. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project IES LM-80.
    - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Installation instructions.

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# 1.06 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Luminaires
  - 2. Structural members to which suspension systems for lighting fixtures will be attached.
  - 3. Other items in finished ceiling including the following:
    - a. Sprinklers.
    - b. Smoke and fire detectors.
- B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.

### 1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

### 1.08 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

### 1.09 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. 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.
- E. Comply with NFPA 70.
- F. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

### 1.10 COORDINATION

A. Coordinate layout and installation of lighting fixtures with other construction, including HVAC equipment, fire-suppression system, and partition assemblies.

### 1.11 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five years starting from date of Owner's acceptance.
- C. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years starting from date of Owner's acceptance. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

26 51 00 - 2 INTERIOR LIGHTING

### **PART 2 - PRODUCTS**

# 2.01 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position.
- D. Diffusers and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 0.125-inch (3.175 mm) minimum unless otherwise indicated.
    - b. UV stabilized
  - 2. Glass: Annealed crystal glass unless otherwise indicated.

### E. Housings:

- 1. Extruded-aluminum housing and heat sink.
- 2. Powder-coat finish.
- F. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles.
  - 1. Label shall include the following lamp and ballast characteristics:
    - a. CCT and CRI for all luminaires.
- G. CRI minimum of 70. CCT of 3500 K
- H. Rated lamp life of 100,000 hours to L70.
- I. Internal Driver.

### 2.02 LED FLAT PANEL

- A. Minimum 3,500 lumens.
- B. Integral junction box with conduit fittings.
- C. Dimming Driver 0-10V.
- D. Integrated Surge Suppression.
- E. Compatible with addressable network controls.

### 2.03 LED LINEAR INDUSTRIAL

- A. Minimum 7,000 lumens.
- B. Universal mounting bracket.
- C. Dimming Driver 0-10V.
- D. Integrated Surge Suppression.
- E. Compatible with addressable network controls.

### 2.04 LED DOWNLIGHT

- A. Minimum 1,000 lumens.
- B. Universal mounting bracket.
- C. Dimming Driver 0-10V.
- D. Integrated Surge Suppression.
- E. Compatible with addressable network controls.
- F. Medium light distribution with fixed lens.

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### 2.05 LED HIGHBAY

- A. Minimum 15,000 lumens.
- B. Universal mounting bracket.
- C. Damp Location rating.
- D. Wide light distribution.
- E. High Impact Resistant polycarbonate lens.
- F. Integrated Surge Suppression.

### 2.06 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
  - 1. Battery: Sealed, maintenance-free, lead-acid type.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
  - 7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

### 2.07 LED EXTERIOR WALL PACK

- A. Minimum 2,000 lumens.
- B. Luminaire Shape: Square, Building mounted.
- C. Distribution: Type 3
- D. Dimming Driver 0-10V.
- E. Integrated Surge Suppression.
- F. Compatible with addressable network controls.

# 2.08 LED EXTERIOR WALL MTD. AREA LUMINAIRE

- A. Minimum 10,000 lumens.
- B. Luminaire Shape: Square, Building mounted.
- C. Distribution: Type 4
- D. Dimming Driver 0-10V.
- E. Integrated Surge Suppression.
- F. Compatible with addressable network controls.

### 2.09 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

26 51 00 - 4 INTERIOR LIGHTING

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### **PART 3 - EXECUTION**

# 3.01 INSTALLATION

- A. Lighting fixtures:
  - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Suspended Lighting Fixture Support:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
  - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
- E. Flush-Mounted Luminaire Support:
  - Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
  - Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

# 3.02 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.03 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
- C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

### 3.04 ADJUSTING

- A. Occupancy Adjustments:
  - 1. Adjust aimable luminaires in the presence of Architect.

# **END OF SECTION**

INTERIOR LIGHTING 26 51 00 - 5

# SECTION 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

#### PART 1 - GENERAL

#### 1.01 DESCRIPTION

A. This section identifies common and general grounding and bonding requirements of communication installations and applies to all sections of Divisions 27 and 28.

#### 1.02 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TGB: Telecommunications grounding busbar.
- D. TMGB: Telecommunications main grounding busbar.

# 1.03 SUBMITTALS

- A. Provide plan indicating location of system grounding electrode connections and routing of aboveground and underground grounding electrode conductors.
- B. Closeout Submittals: Provide the following:
  - 1. Certified test reports of ground resistance.

# **PART 2 PRODUCTS**

# 2.01 COMPONENTS

- A. Grounding and Bonding Conductors:
  - Provide UL 83 insulated stranded copper equipment grounding conductors with the
    exception of solid copper conductors for sizes 6 mm² (10 AWG) and smaller. Identify all
    grounding conductors with continuous green insulation color, except identify wire sizes 25
    mm² (4 AWG) and larger per NEC.
  - 2. Provide ASTM B8 bare stranded copper bonding conductors with the exception of ASTM B1 solid bare copper for wire sizes 6 mm² (10 AWG) and smaller.

### B. Ground Rods:

- 1. Copper clad steel, 19 mm (3/4-inch) diameter by 3000 mm (10 feet) long, conforming to UL 467.
- 2. Provide quantity of rods required to obtain specified ground resistance.
- C. Splices and Termination Components: Provide components meeting or exceeding UL 467 and clearly marked with manufacturer's name, catalog number, and permitted conductor sizes.
- D. Telecommunication System Ground Busbars:
  - 1. Telecommunications Main Grounding Busbar (TMGB):
    - a. 6.4 mm (1/4 inch) thick solid copper bar.

- b. Minimum 75 mm (3 inches) high and length sized in accordance application requirements and future growth of minimum 200 mm (8 inches) long.
- Wall-mount stand-off brackets, assembly screws and insulators for 100 mm (4 inches) standoff from wall.
- d. Listed as grounding and bonding equipment.
- E. Splice Case Ground Accessories: Provide splice case grounding and bonding accessories manufactured by splice case manufacturer when available. Otherwise, use 16 mm² (6 AWG) insulated ground wire with shield bonding connectors.
- F. Irreversible Compression Lugs:
  - 1. Electroplated tinned copper.
  - 2. Two holes spaced on 15.8 mm (5/8 inch) or 25.4 mm (1 inch) centers.
  - 3. Sized to fit the specific size conductor.
  - 4. Listed as wire connectors.
- G. Antioxidant Joint Compound: Oxide inhibiting joint compound for copper-to-copper, aluminum-to-aluminum, or aluminum-to-copper connections.

# **PART 3 EXECUTION**

# 3.01 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Exterior Equipment Grounding: Bond exterior metallic components raceways, primary telecommunications protector/arresters, secondary surge protection,, cable shields, and other conductive items to directly to Intersystem Bonding Termination.
- B. Install telecommunications bonding backbone conductor throughout building via telecommunications backbone pathways effectively bonding all interior telecommunications grounding busbars in telecommunications rooms to telecommunications main grounding busbar after testing bond to verify bonding conductor for telecommunications from grounding electrode conductor is installed per NEC. Size telecommunications bonding backbone conductor as specified in TIA-607-B.
  - Inaccessible Grounding Connections: Utilize exothermic welding for bonding of buried or otherwise inaccessible connections with the exception of connections requiring periodic testing.
  - 2. Conduit Systems:
    - a. Bond ferrous metallic conduit to ground.
    - b. Bond grounding conductors installed in ferrous metallic conduit at both ends of conduit using grounding bushing with #6 AWG conductor.
  - 3. Boxes, Cabinets, and Enclosures:

- a. Bond each pull box, splice box, equipment cabinet, and other enclosures through which conductors pass (except for special grounding systems for intensive care units and other critical units shown) to ground.
- 4. Corrosion Inhibitors: Apply corrosion inhibitor for protecting connection between metals used to contact surfaces, when making ground and ground bonding connections.
- 5. Telecommunications Grounding System:
  - Bond telecommunications grounding systems and equipment to facility's electrical grounding electrode at Intersystem Bonding Termination.
  - b. Provide hardware as required to effectively bond metallic cable shields communications pathways, cable runway, and equipment chassis to ground.
  - c. Install bonding conductors without splices using shortest length of conductor possible to maintain clearances required by NEC.
  - d. Provide paths to ground that are permanent and continuous with a resistance of 1 ohm or less from each raceway, cable tray, and equipment connection to telecommunications grounding busbar.
  - e. Below-Grade Connections: When making exothermic welds, wire brush or file the point of contact to a bare metal surface. Use exothermic welding cartridges and molds in accordance with manufacturer's recommendations. After welds have been made and cooled, brush slag from weld area and thoroughly clean joint areas.
  - f. Above-Grade Bolted or Screwed Grounding Connections:
    - 1) Remove paint to expose entire contact surface by grinding.
    - 2) Clean all connector, plate and contact surfaces.
    - 3) Apply corrosion inhibitor to surfaces before joining.
  - g. Bonding Jumpers:
    - Assemble bonding jumpers using insulated ground wire of size and type shown on drawings or use a minimum of 16 mm² (6 AWG) insulated copper wire terminated with compression connectors of proper size for conductors.
    - 2) Use connector manufacturer's compression tool.
  - h. Bonding Jumper Fasteners:
    - Conduit: Connect bonding jumpers using lugs on grounding bushings or clamp pads on push-type conduit fasteners. Where appropriate, use zincplated external tooth lock washers or Belleville Washers.
    - Wireway and Cable Tray: Fasten bonding jumpers using zinc-plated bolts, external tooth lock washers or Belleville washers and nuts. Install protective cover, e.g., zinc-plated acorn nuts, on bolts extending into wireway or cable tray to prevent cable damage.

- Grounding Busbars: Fasten bonding conductors using two-hole compression lugs. Use 300 series stainless steel bolts, Belleville Washers, and nuts.
- 4) Slotted Channel Framing and Raised Floor Stringers: Fasten bonding jumpers using zinc-plated, self-drill screws and Belleville washers or external tooth lock washers.
- 5) Telecommunications Room Bonding:
- i. Telecommunications Grounding Busbars:
  - 1) Install busbar hardware no less than 950 mm (18 inches) A.F.F.
  - Where other grounding busbars are located in same room, e.g. electrical panelboard for telecommunications equipment, bond busbars together as indicated on grounding riser diagrams.
  - 3) Make conductor connections with two-hole compression lugs sized to fit busbar and conductors.
  - 4) Attach lugs with stainless steel hardware after preparing bond according to manufacturer recommendations and treating bonding surface on busbar with antioxidant to help prevent corrosion.
- 6. Backboards: Provide a screw lug-type terminal block or drilled and tapped copper strip near top of backboards used for communications cross-connect systems. Connect backboard ground terminals to cable runway using an insulated 16 mm² (6 AWG) bonding jumper.
- 7. Communications Cable Grounding:
  - a. Bond all metallic cable sheaths in multi-pair communications cables together at each splicing or terminating location to provide 100 percent metallic sheath continuity throughout communications distribution system.
  - b. Install a cable shield bonding connector with a screw stud connection for ground wire, at terminal points. Bond cable shield connector to ground.
  - c. Bond all metallic cable shields together within splice closures using cable shield bonding connectors or splice case manufacturer's splice case grounding and bonding accessories. When an external ground connection is provided as part of splice closure, connect to an effective ground source and bond all other metallic components and equipment at that location.
- 8. Communications Cable Tray Systems:
  - a. Bond metallic structures of cable tray to provide 100 percent electrical continuity throughout cable tray systems.
  - b. Where metallic cable tray systems are mechanically discontinuous:

- Install splice plates provided by cable tray manufacturer between cable tray sections so resistance across a bolted connection is 0.010 ohms or less, as verified by measuring across splice plate connection.
- 2) Install 16 mm² (6 AWG) bonding jumpers across each cable tray splice or junction where splice plates cannot be used.
- c. Bond cable tray installed in same room as telecommunications grounding busbar to busbar.

# 9. Communications Raceway Grounding:

- a. Conduit: Use insulated 16 mm² (6 AWG) bonding jumpers to bond metallic conduit at both ends and intermediate metallic enclosures to ground.
- b. Cable Tray Systems: Use insulated 16 mm² (6 AWG) grounding jumpers to bond cable tray to column-mounted building ground plates (pads) at both ends and approximately 16 meters (50 feet) on centers.

# 10. Ground Resistance:

- a. Install telecommunications grounding system so resistance to grounding electrode system measures 5 ohms or less.
- b. Measure grounding electrode system resistance using an earth test meter, clampon ground tester, or computer-based ground meter as defined in IEEE 81. Record ground resistance measurements before electrical distribution system is energized.
- c. Backfill only after below-grade connection have been visually inspected.

# 11. Ground Rod Installation:

- a. Drive each rod vertically in earth minimum 3000 mm (10 feet) in depth.
- Make connections by exothermic process to form solid metal joints, where permanently concealed ground connections are required. Make accessible ground connections with mechanical pressure type ground connectors.
- Install angled ground rods or grounding electrodes in horizontal trenches to achieve specified resistance, where rock prevents driving of vertical ground rods.

# 3.02 FIELD QUALITY CONTROL

- Perform tests per BICSI's Information Technology Systems Installation Methods Manual (ITSIMM), Recommended Testing Procedures and Criteria.
- 2. Perform two-point bond test using trained installers qualified to use test equipment.
- 3. Conduct continuity test to verify that metallic pathways in telecommunications spaces are bonded telecommunication ground bus.
- 4. Conduct electrical continuity test to verify that telecommunication ground bus is effectively bonded to grounding electrode conductor.
- 5. Visually inspect to verify that screened and shielded cables are bonded to telecommunication ground bus.

6. Perform a resistance test to ensure patch panel, rack and cabinet bonding connection resistance measures less than 5 Ohms to telecommunication ground bus.

# **END OF SECTION**

# SECTION 27 05 33 RACEWAYS, BOXES, AND CABLING FOR COMMUNICATIONS SYSTEMS

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION

A. This section specifies horizontal cabling, conduit, fittings, and boxes to form complete, coordinated, raceway systems. Raceways are required for communications cabling unless shown or specified otherwise.

# 1.02 SUBMITTALS

- A. Submit the following:
  - 1. Size and location of cabinets, splice boxes and pull boxes.
  - 2. Layout of required conduit penetrations through structural elements.
  - 3. Catalog cuts marked with specific item proposed and area of application identified.
- B. Certification: Provide letter prior to final inspection, certifying material is in accordance with construction documents and properly installed.
- C. Cabling administration Drawings and printouts.
- D: Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
  - 1. Telecommunications rooms plans and elevations.
  - 2. Telecommunications pathways.
  - 3. Telecommunications system access points.
  - 4. Telecommunications grounding system.
  - 5. Telecommunications conductor drop locations.
  - 6. Typical telecommunications details.
  - 7. Mechanical, electrical, and plumbing systems

### **PART 1 - PRODUCTS**

# 2.01 CATEGORY 3 TWISTED PAIR CABLE:

- A. Manufacturers:
  - 1. Belden
  - 2. Leviton
  - 3. General Cable
  - 4. Or Approved Equal
- B. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 3 cable at frequencies up to 16 MHz.
- C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 3 cables.
- D. Conductors: 100-ohm, 24 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP)
- F. Cable Rating: Plenum.

- G. Jacket: Thermoplastic with telephone industry standard color coding.
- H. General Requirements for Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 3.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  - 3. Cables shall be terminated with connecting hardware of same category or higher.

# 2.02 CATEGORY 6 TWISTED PAIR CABLE:

- A. Manufacturers:
  - 1. Belden
  - 2. Leviton
  - 3. General Cable
  - 4. Or Approved Equal
- B. Description: Four-pair, balanced-twisted pair cable with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 24 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP)
- F. Cable Rating: Plenum.
- G. Jacket: Thermoplastic with data industry standard color coding.
- H. General Requirements for Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 6.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  - 3. Cables shall be terminated with connecting hardware of same category or higher.

# 2.03 TWISTED PAIR CABLE HARDWARE:

- A. Manufacturers:
  - 1. Belden
  - 2. Leviton
  - 3. General Cable
  - 4. Or Approved Equal
- B. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- C. General Requirements for Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 6 and Category 3.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.

3. Cables shall be terminated with connecting hardware of same category or higher.

# D. Connecting Blocks:

- 1. 110-style IDC for Category 6.
- 2. Provide blocks for the number of cables terminated on the block, plus 25% spare, integral with connector bodies including plugs and jacks where indicated.

# E. Plugs and Plug Assemblies:

- 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
- 2. Standard: Comply with TIA-568-C.2.
- 3. Marked to indicate transmission performance.

### F. Jacks and Jack Assemblies.

- 1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
- 2. Designed to snap-in to a patch panel or faceplate.
- 3. Standard: Comply with TIA-568-C.2.
- 4. Marked to indicate transmission performance.

# G. Faceplate.

- 1. Six port, vertical single gang faceplates designed to mount to single gang wall boxes.
- Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
- 3. Metal faceplate: stainless steel, complying with requirements in Section 262726 "Wiring Devices."
- 4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
  - a) Flush mounting jacks, positioning the cord at a 45-degree angle.

# H. Legend:

- 1. Machine printed, in the field, using adhesive-tape label.
- 2. Snap-in, clear-label covers and machine-printed paper inserts.

# 2.04 CONDUIT MATERIAL

- A. Conduit Size: 19 mm (3/4 inch).
- B. Conduit:
  - 1. Rigid Galvanized Steel: Conform to UL 6, ANSI C80.1.
  - 2. IMC: Comply with ANSI C80.6 and UL 1242.
  - 3. EMT: Comply with ANSI C80.3 and UL 797.
    - a. Maximum Size: 105 mm (4 inches)
    - b. Install only for cable rated 600 volts or less.
    - c. Conform to UL 797, ANSI C80.3.

### C. Manufacturers:

1. AFC Cable Systems, Inc.

- 2. Allied Tube & Conduit; a part of Atkore International.
- 3. Anamet Electrical, Inc.
- 4. Electri-Flex Company.
- 5. FSR Inc.
- 6. O- /Gedney; a brand of Emerson Industrial Automation.
- 7. Patriot Aluminum Products, LLC.
- 8. Picoma Industries, Inc.
- 9. Republic Conduit.
- 10. Robroy Industries.
- 11. Southwire Company.
- 12. Thomas & Betts Corporation, A Member of the ABB Group.
- 13. Western Tube and Conduit Corporation.
- 14. Wheatland Tube Company.

# 2.05 SURFACE METAL RACEWAY:

- A. Conform to UL 5.
- B. Galvanized steel with Snap-On covers, complying with UL 5.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application. Comply with TIA-569-D
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. MonoSystems, Inc.
  - 4. Square D.

# 2.06 WIREWAY APPROVED BASKET

- A.. Provide "Telecommunications Service" rated with approved length way partitions and cable straps to prevent wires and cables from changing from one partitioned pathway to another
- B. Manufacturers:
  - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
  - 2. Hoffman; a brand of Pentair Equipment Protection.
  - 3. MonoSystems, Inc.
  - 4. Square D.

### 2.07 CONDUIT FITTINGS:

- 1. Rigid Galvanized Steel and Rigid Intermediate Steel Conduit Fittings:
  - A . Provide fittings meeting requirements of UL 514B and ANSI/ NEMA FB 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.

- B. Sealing: Provide threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water and vapor. In concealed work, install sealing fittings in flush steel boxes with blank cover plates having same finishes as other electrical plates in room.
- C. Standard Threaded Couplings, Locknuts, Bushings, and Elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
- D. Locknuts: Bonding type with sharp edges for digging into metal wall of an enclosure.
- E. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into metallic body of fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
- F. Erickson (union-type) and Set Screw Type Couplings:
  - i. Couplings listed for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete.
  - ii. Use set screws of case hardened steel with hex head and cup point to seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
- G. Provide OEM approved fittings.
  - Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
- 2. Electrical Metallic Tubing Fittings:
  - a. Conform to UL 514B and ANSI/ NEMA FB1; only steel or malleable iron materials are acceptable. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  - b. Couplings and Connectors: Concrete tight and rain tight, with connectors having insulated throats.
    - Use gland and ring compression type couplings and connectors for conduit sizes
       mm (2 inches) and smaller.
    - 2. Die cast compression fittings.
  - C. Indent type connectors or couplings are not permitted.
  - D. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are not permitted.
  - E. Provide OEM approved fittings.
- 3. Surface Metal Raceway: Conform to UL 5 and "telecommunications service" rated with approved length-way partitions and cable straps to prevent wires and cables from changing from one partitioned pathway to another.

- 4. Surface Metal Raceway Fittings: As recommended by raceway manufacturer.
- 5. Expansion and Deflection Couplings:
  - a. Conform to UL 467 and UL 514B.
  - a. Accommodate 19 mm (3/4 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
  - Include internal flexible metal braid sized to ensure conduit ground continuity and fault currents in accordance with UL 467, and NEC code tables for ground conductors.
  - c. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.
- 6. Wireway Fittings: As recommended by wireway OEM.
- D. Conduit Supports:
  - 1. Parts and Hardware: Provide zinc-coat or equivalent corrosion protection.
  - 2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
  - Multiple Conduit (Trapeze) Hangers: Minimum 38 mm by 38 mm (1-1/2 by 1-1/2 inch),
     78 mm (12 gage) steel, cold formed, lipped channels; with minimum 9 mm (3/8 inch) diameter steel hanger rods.
  - 4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.
- E. Outlet, Splice, and Pull Boxes:
  - 1. Conform to UL-50 and UL-514A.
  - 2. Cast metal where required by NEC or shown, and equipped with rustproof boxes.
  - 3. Sheet Metal Boxes: Galvanized steel, except where otherwise shown.
  - 4. Install flush mounted wall or ceiling boxes with raised covers so that front face of raised cover is flush with wall.
  - 5. Install surface mounted wall or ceiling boxes with surface style flat or raised covers.
- F. Wireways: Equip with hinged covers, except where removable covers are shown.
- G. Warning Tape: Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape detectable type, red with black letters, and imprinted with "CAUTION BURIED COMMUNICATIONS CABLE BELOW".
- 8. Outlet Boxes:

- 1. Flush wall mounted minimum 11.9 cm (4-11/16 inches) square, 9.2 cm (3-5/8 inches) deep pressed galvanized steel.
- 2. 2-Gang Tile Box:
  - a. Flush backbox type for installation in block walls.
  - b. Minimum 92 mm (3-5/8 inches) deep.
- Weatherproof Outlet Boxes: Surface mount two gang, 67 mm (2-5/8 inches) deep weatherproof cast aluminum with powder coated finish internal threads on hubs 19 mm (3/4 inch) minimum.
- 10. Cable Tray:
  - 1. Provide wire basket type of sizes indicated; with all required splicing and mounting hardware.
  - 2. Materials and Finishes:
    - A. Electro-plated zinc galvanized (post plated) made from carbon steel and plated to ASTM B 633, Type III, SC-1.
    - B. Remove soot, manufacturing residue/oils, or metallic particles after fabrication.
    - C. Rounded edges and smooth surfaces.
  - 3. Provide continuous welded top side wire to protect cable insulation and installers.
  - 4. High strength steel wires formed into a 50 x 100 mm (2 inches by 4 inches) wire mesh pattern with intersecting wires welded together.
  - 5. Wire Basket Sizes:
    - a. Wire Diameter: 5 mm (0.195 inch) minimum on all mesh sections.
    - b. Usable Loading Depth: 105 mm (4 inch)
    - c. Width: 300 mm (12 inches).
  - Fittings: Field-formed, from straight sections, in accordance with manufacturer's instructions.

Provide accessories to protect, support and install wire basket tray system.

# **PART 3 - EXECUTION**

### 3.01 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

### 3.02 EQUIPMENT INSTALLATION AND REQUIREMENTS

#### A. Penetrations:

- 1. Cutting or Holes:
  - a. Locate holes in advance of installation. Coordinate with Architect where penetrations conflict.
  - b. Make holes through concrete and masonry in new structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not permitted.
  - c. Fire Stop: Where conduits, wireways, and other communications raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING.
    - Fill and seal clearances between raceways and openings with fire stop material.
      - 2) Install only retrofittable, non-hardening, and reusable firestop material that can be removed and reinstalled to seal around cables inside conduits.
  - d. Waterproofing at Floor, Exterior Wall, and Roof Conduit Penetrations:
    - Seal clearances around conduit and make watertight as directed by waterproofing manufacturer.

### B. Conduit Installation:

- 1. Minimum conduit size of 19 mm (3/4 inch), but not less than size required for 40 percent fill.
- 2. Install insulated bushings on all conduit ends.
- 3. Install pull boxes after every 180 degrees of bends (two 90 degree bends). Size boxes per TIA 569.
- 4. Where drilling is necessary for vertical conduits, locate holes so as not to affect structural sections.
- Seal empty conduits located in telecommunications rooms or on backboards with a standard non-hardening putty compound to prevent entrance of moisture and gases and to meet fire resistance requirements.
- 6. Minimum radius of communication conduit bends:

Sizes of Conduit	Radius of Conduit Bends		
Trade Size	mm, Inches		
3/4	150 (6)		
1	230 (9)		
1-1/4	350 (14)		
1-1/2	430 (17)		
2	525 (21)		
2-1/2	635 (25)		
3	775 (31)		
3-1/2	900 (36)		
4			

- Provide 19 mm (3/4 inch) thick fire retardant plywood specified in Section 06 10 00, ROUGH CARPENTRY on wall of communication closets where shown on drawings.
   Mount plywood with bottom edge 300 mm (12 inches) above finished floor and top edge 2.74 m (9 feet) A.F.F.
- 8. Provide pull wire in all empty conduits; sleeves through floor are exceptions.
- 9. Complete each entire conduit run installation before pulling in cables.
- 10. Flattened, dented, or deformed conduit is not permitted.
- 11. Ensure conduit installation does not encroach into ceiling height head room, walkways, or doorways.
- 12. Cut conduit square with a hacksaw, ream, remove burrs, and draw tight.
- 13. Install conduit mechanically continuous.
- 14. Independently support conduit at 2.44 m (8 feet) on center; do not use other supports (i.e., suspended ceilings, suspended ceiling supporting members, luminaires, conduits, mechanical piping, or mechanical ducts).
- Support conduit within 300 mm (1 foot) of changes of direction, and within 300 mm (1 foot) of each enclosure to which connected.
- Close ends of empty conduit with plugs or caps to prevent entry of debris, until cables are pulled in.
- 17. Attach conduits to cabinets, splice cases, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on inside of enclosure, made up wrench tight. Do not make conduit connections to box covers.
- 18. Do not use aluminum conduits in wet locations.
- 19. Unless otherwise indicated on drawings or specified herein, conceal conduits within finished walls, floors and ceilings.

# 20. Conduit Bends:

- a. Make bends with standard conduit bending machines; observe minimum bend radius for cable type and outside diameter.
- b. Conduit hickey is permitted only for slight offsets, and for straightening stubbed conduits.
- c. Bending of conduits with a pipe tee or vise is not permitted.
- 21. Layout and Homeruns Deviations: Make only where necessary to avoid interferences and only after drawings showing proposed deviations have been submitted and approved by COR.

### C. Concealed Work Installation:

- 1. In Concrete:
  - a. Conduit: Rigid steel or IMC.
  - b. Align and run conduit in direct lines.
  - c. Install conduit through concrete beams only when the following occurs:
    - 1) Where shown on structural drawings.
  - Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
    - 1) Conduit outside diameter larger than 1/3 of slab thickness is prohibited.
    - 2) Space between Conduits in Slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
    - 3) Install conduits approximately in center of slab to ensure a minimum of 19 mm (3/4 inch) of concrete around conduits.
  - Make couplings and connections watertight. Use thread compounds that are NRTL listed conductive type to ensure low resistance ground continuity through conduits.
     Tightening set screws with pliers is not permitted.
- E, Furred or Suspended Ceilings and in Walls:
  - 1. EMT. Different type conduits mixed indiscriminately in same system is not permitted.
  - 2. Align and run conduit parallel or perpendicular to building lines.
  - 3. Tightening set screws with pliers is not permitted.
- F. Exposed Work Installation:
  - 1. Unless otherwise indicated on drawings, exposed conduit is only permitted in telecommunications rooms.
    - a. EMT.

- b. Different type of conduits mixed indiscriminately in system is not permitted.
- 2. Align and run conduit parallel or perpendicular to building lines.
- 3. Install horizontal runs close to ceiling or beams and secure with conduit straps.
- 4. Support horizontal or vertical runs at not over 2400 mm (96 inches) intervals.
- 5. Surface Metal Raceways: Use only where shown on drawings.
- 6. Painting:
  - a. Paint exposed conduit as specified in Section 09 91 00, PAINTING.
  - b. Refer to Section 09 91 00, PAINTING for preparation, paint type, and exact color.
  - c. Provide labels where conduits pass through walls and floors and at maximum 6000 mm (20 foot) intervals in between.

# G. Expansion Joints:

- Conduits 75 mm (3 inches) and larger, that are secured to building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install couplings in accordance with manufacturer's recommendations.
- Provide conduits smaller than 75 mm (3 inches) with pull boxes on both sides of expansion joint. Connect conduits to expansion and deflection couplings as specified.
- 3. Install expansion and deflection couplings where shown.

# D. Conduit Supports, Installation:

- Select AC193 code listed mechanical anchors or fastening devices with safe working load not to exceed 1/4 of proof test load.
- 2. Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 2.5 m (8 foot) on center.
- Support multiple conduit runs with trapeze hangers. Use trapeze hangers designed to support a load equal or greater than sum of the weights of the conduits, wires, hanger itself, and 90 kg (200 pounds). Attach each conduit with U-bolts or other accepted fasteners.
- 4. Support conduit independent of pull boxes, luminaires, suspended ceiling components, angle supports, duct work, and similar items.
- 5. Fastenings and Supports in Solid Masonry and Concrete:
  - a. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing concrete.
  - b. Existing Construction:
    - 1) Code AC193 listed wedge type steel expansion anchors minimum 6 mm (1/4 inch) bolt size and minimum 28 mm (1-1/8 inch) embedment.

- 2) Power set fasteners minimum 6 mm (1/4 inch) diameter with depth of penetration minimum 75 mm (3 inches).
- 3) Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.
- 6. Fastening to Hollow Masonry: Toggle bolts are permitted.
- 7. Fastening to Metal Structures: Use machine screw fasteners or other devices designed and accepted for application.
- 8. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- 9. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- 10. Do not support conduit from chain, wire, or perforated strap.
- 11. Spring steel type supports or fasteners are not permitted except horizontal and vertical supports/fasteners within walls.
- 12. Vertical Supports:
  - a. Install riser clamps and supports for vertical conduit runs in accordance with NEC.
  - b. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

### E. Box Installation:

- 1. Boxes for Concealed Conduits:
  - A. Flush mounted.
  - B. Provide raised covers for boxes to suit wall or ceiling, construction and finish.
- 2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables during pulling.
- 3. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- 4. Stencil or install phenolic nameplates on covers of boxes identified on riser diagrams; for example "SIG-FA JB No. 1".
- 5. Outlet boxes mounted back-to-back in same wall are not permitted. A minimum 600 mm (24 inches) center-to-center lateral spacing must be maintained between boxes.

### F. Box Installation:

- A. Cables shall not be spliced.
- B. Terminate all cables at predetermined patch panel locations. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."

# 3.03 TESTING

- A. Examine fittings and locknuts for secureness.
- B. Test RMC, IMC and EMT systems for electrical continuity.
- C. Perform simple continuity test after cable installation.

# **END OF SECTION**

# **SECTION 28 31 76**

# INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE

### PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2 (2009; R 2014) Method for Measuring the Intelligibility of

Speech Over Communication Systems (ASA 85)

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide

http://www.approvalguide.com/

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002; R 2008) Guide on the Surges Environment in Low-

Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on Characterization of Surges

in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 4 (2018) Standard for Integrated Fire Protection and Life Safety

System Testing

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-

2; TIA 20-3; TIA 20-4) National Electrical Code

NFPA 72 (2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and

Signaling Code

NFPA 90A (2021) Standard for the Installation of Air Conditioning and

Ventilating Systems

NFPA 170 (2021) Standard for Fire Safety and Emergency Symbols

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-601-02 (2010) Operations and Maintenance: Inspection, Testing, and

Maintenance of Fire Protection Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15 Radio Frequency Devices

47 CFR 90 Private Land Mobile Radio Services

# UNDERWRITERS LABORATORIES (UL)

UL 268	(2016; Reprint Oct 2019) UL Standard for Safety Smoke Detectors for Fire Alarm Systems
UL 268A	(2008; Reprint Oct 2014) Smoke Detectors for Duct Application
UL 464	(2016; Reprint Sep 2017) UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 497A	(2001; Bul. 2019) UL Standard for Safety Secondary Protectors for Communications Circuits
UL 497B	(2004; Reprint Dec 2012) Protectors for Data Communication Circuits
UL 521	(1999; Reprint Dec 2017) UL Standard for Safety Heat Detectors for Fire Protective Signaling Systems
UL 864	(2014; Reprint May 2020) UL Standard for Safety Control Units and Accessories for Fire Alarm Systems
UL 1283	(2017) UL Standard for Safety Electromagnetic Interference Filters
UL 1449	(2021) UL Standard for Safety Surge Protective Devices
UL 1480	(2016; Reprint Sep 2017) UL Standard for Safety Speakers for Fire Alarm and Signaling Systems, Including Accessories
UL 1638	(2016; Reprint Sep 2017) UL Standard for Safety Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired
UL 2017	(2008; Reprint Dec 2018) UL Standard for Safety General- Purpose Signaling Devices and Systems
UL 2034	(2017; Reprint Sep 2018) UL Standard for Safety Single and Multiple Station Carbon Monoxide Alarms
UL 2075	(2013; Bul. 2019) UL Standard for Safety Gas and Vapor Detectors and Sensors
UL 2572	(2016; Bul. 2018) UL Standard for Safety Mass Notification Systems
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory SUMMARY

# 1.3.1 **Scope**

- a. This work includes designing and providing a new, complete, fire alarm and mass notification (MNS) system as described herein and on the contract drawings for the vehicle maintenance shop, building B8424. Include system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, initiating devices, notification appliances, supervising station fire alarm / mass notification modems, and other accessories and miscellaneous items required for a complete operational system even though each item is not specifically mentioned or described. Provide system complete and ready for operation.
- b. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with NFPA 72, except as modified herein. The system layout on the drawings shows the intent of coverage and suggested locations. Final quantity, system layout, and coordination are the responsibility of the Contractor.
- c. The fire alarm and mass notification system must be independent of the building security, building management, and energy/utility monitoring systems other than for control functions.

### 1.4 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions must be defined as follows:

# 1.4.1 Interface Device

An addressable device that interconnects hard wired systems or devices to an analog/addressable system.

# 1.4.2 Fire Alarm and Mass Notification Control Unit (FMCU)

A master control unit having the features of a fire alarm control unit (FACU) and an autonomous control unit (ACU) where these units are interconnected to function as a combined fire alarm/mass notification system. The FACU and ACU functions may be contained in a single cabinet or in independent, interconnected, and co-located cabinets.

### 1.4.3 Remote Fire Alarm and Mass Notification Control Unit

A control unit, physically remote from the fire alarm and mass notification control unit, that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; may provide transfer of condition to relays or devices connected to the control unit; and reports to and receives signals from the fire alarm and mass notification control unit.

# 1.4.4 Local Operating Console (LOC)

A unit designed to allow emergency responders and/or building occupants to operate the MNS including delivery of recorded messages and/or live voice announcements, initiate visual, and audible appliance operation and other related functions.

#### 1.4.5 Terminal Cabinet

A steel cabinet with locking, hinge-mounted door where terminal strips are securely mounted inside the cabinet.

# 1.4.6 Control Module and Relay Module

Terms utilized to describe emergency control function interface devices as defined by NFPA 72.

# 1.4.7 Fire Protection Authority Having Jurisdiction

The State of Alabama Fire Marshall is the designated Authority Having Jurisdiction (FPAHJ). The FPAHJ may be responsible for review of contractor submittals and for witnessing and accepting final inspection and testing.

# 1.4.8 Qualified Fire Protection Engineer (QFPE)

A QFPE is an individual who is a licensed professional engineer (P.E.), with a minimum of 5 years of Fire Protection Design experience.

# 1.4.9 Monitoring Agency

A 24-Hour monitoring agency responsible for receiving and interpreting all alarm, trouble, and supervisory output signals. The agency will direct appropriate personnel and resources.

### 1.5 SUBMITTALS

Shop drawings, product data and calculations must be prepared by the fire alarm designer and combined and submitted as one complete package. The QFPE must review the submittal package for completeness and compliance with the Contract provisions prior to submission to the Owner. The QFPE must provide a Letter of Confirmation that they have reviewed the submittal package for compliance with the contract provisions. This letter must include their registered professional engineer stamp and signature. Partial submittals and submittals not reviewed by the QFPE will be returned by the Owner disapproved without review.

Submit the following in accordance with UFC 3-600-01:

# Preconstruction Submittals

- Installer

# **Shop Drawings**

- Nameplates
- Instructions
- Wiring Diagrams
- System Layout
- Notification Appliances
- Initiating devices
- Amplifiers
- Battery Power
- Voltage Drop Calculations

# **Product Data**

- Fire Alarm and Mass Notification Control Unit (FMCU)
- Local Operating Console (LOC)
- Tone Generators
- Digitalized voice generators
- LCD Annunciator
- Manual Stations
- Smoke Detectors
- Heat Detectors
- Multi-Criteria Detectors
- Carbon monoxide detector
- Addressable Interface Devices
- Addressable Control Modules
- Isolation Modules
- Notification Appliances
- Batteries
- Battery Chargers
- Supplemental Notification Appliance Circuit Panels
- Surge Protective Devices
- Alarm Wiring
- Back Boxes and Conduit
- Ceiling Bridges for Ceiling-Mounted Appliances
- Terminal Cabinets
- FMCU Cellular Communication Modem

# **Test Reports**

- Test Procedures

# Certificates

- Verification of Compliant Installation

Request for the Owner's Final Test

Operation and Maintenance Data

- Operation and Maintenance (O&M) Instructions
- Instruction of Owner's Employees

# Closeout Submittals

- As-Built Drawings
- Spare Parts

### 1.6 SYSTEM OPERATION

Fire alarm system/mass notification system components requiring power, except for the FMCU(s) power supply, must operate on 27.4 volts DC unless noted otherwise in this section.

The interior fire alarm and mass notification system must be a complete, supervised, noncoded, analog/addressable fire alarm and mass notification system conforming to NFPA 72 and UL 864. The system must be activated into the alarm mode by actuation of an alarm initiating device. The system must remain in the alarm mode until the initiating device is reset and the control unit is reset and restored to normal. The system may be placed in the alarm mode by local microphones, LOC, FMCU, or remotely from authorized locations/users.

# 1.6.1 Signaling Line Circuits (SLC)

a. The SLC shall be capable of functioning in a Class B configuration.

# 1.6.2 Functions and Operating Features

The system must provide the following functions and operating features:

- a. Power, annunciation, supervision, and control for the system. Addressable systems must be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
- b. Visual alarm notification appliances must be synchronized as required by NFPA 72.
- c. Electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control unit.
- d. An audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal must also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory control unit modules. After the system returns to normal operating conditions, the trouble signal must again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke must not initiate a trouble condition.
- e. A trouble signal silence feature that must silence the audible trouble signal, without affecting the visual indicator.

- f. Program capability via switches in a locked portion of the FMCU to bypass the automatic notification appliance circuits, air handler shutdown features. Operation of this programmed action must indicate on the FMCU display as a supervisory or trouble condition.
- g. Alarm functions must override trouble or supervisory functions. Supervisory functions must override trouble functions.
- h. The system must be capable of being programmed from the control unit keyboard. Programmed information must be stored in non-volatile memory.
- i. The system must be capable of operating, supervising, and/or monitoring non-addressable alarm and supervisory devices.
- j. There must be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.
- k. Where the fire alarm/mass notification system is responsible for initiating an action in another emergency control device or system, such as HVAC, the addressable fire alarm relay must be located in the vicinity of the emergency control device.
- I. An alarm signal must automatically initiate the following functions:
  - (1) Transmission of an alarm signal to the monitoring agency.
  - (2) Visual indication of the device operated on the FMCU and on the remote annunciator.
  - (3) Actuation of alarm notification appliances.
  - (4) Recording of the event electronically in the history log of the FMCU.
- m. A supervisory signal must automatically initiate the following functions:
  - (1) Visual indication of the device operated on the FMCU and on the remote annunciator.
  - (2) Transmission of a supervisory signal to the monitoring agency.
  - (3) Operation of a duct smoke detector must shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph and as allowed by NFPA 72.
  - (4) Recording of the event electronically in the history log of the FMCU.
- n. A trouble condition must automatically initiate the following functions:
  - (1) Visual indication of the device operated on the FMCU and on the remote annunciator.
  - (2) Transmission of a trouble signal to the monitoring agency.
  - (3) Recording of the event electronically in the history log of the FMCU.
- o. Activation of a carbon monoxide alarm initiating device must automatically initiate the following functions:
  - (1) Visual indication of the device operated on the FMCU and on the remote annunciator.
  - (2) Activation of all strobes and the audible carbon monoxide message throughout the building.

- (3) Recording of the event electronically in the history log of the FMCU.
- p. System control equipment must be programmed to provide a 60-minute to 180-minute delay in transmission of trouble signals resulting from primary power failure.
- q. Activation of a LOC pushbutton must activate the audible and visual mass notification alarms in the facility. The audible message must be the one associated with the pushbutton activated.

# 1.7 TECHNICAL DATA AND SITE-SPECIFIC SOFTWARE

Technical data and site-specific software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be required in other specifications, must be delivered, strictly in accordance with the CONTRACT CLAUSES. The fire alarm system manufacturer must submit written confirmation of this contract provision as "Fire Alarm System Site-Specific Software Acknowledgement". Identify data delivered by reference to the specification paragraph against which it is furnished. Data to be submitted must include complete system, equipment, and software descriptions. Descriptions must show how the equipment will operate as a system to meet the performance requirements of this contract. The site-specific software data package must also include the following:

- a. Items identified in NFPA 72, titled "Site-Specific Software".
- b. Identification of programmable portions of the system equipment and capabilities.
- c. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- d. Provision of operational software data on all modes of programmable portions for fire alarm and mass notification.
- e. Description of Fire Alarm and Mass Notification Control Unit equipment operation.
- f. Description of auxiliary and remote equipment operations.
- g. Library of application software.
- h. Operation and maintenance manuals.

### 1.9 QUALITY ASSURANCE

# 1.9.1 Submittal Documents

### 1.9.1.1 Preconstruction Submittals

Within 36 days of contract award but not less than 14 days prior to commencing any work on site, the Contractor must submit the following for review and approval. Shop Drawings and Product Data submittals received prior to the review and approval of the qualifications of the fire alarm subcontractor and QFPE must be returned disapproved without review. All resultant delays must be the sole responsibility of the Contractor.

# 1.9.1.2 Shop Drawings

Shop drawings must not be smaller than the Contract Drawings. Drawings must comply with the requirements of NFPA 72 and NFPA 170. Minimum scale for floor plans must be 1/8"=1'.

### 1.9.1.3 Nameplates

Nameplate illustrations and data to obtain approval by the Contracting Officer before installation.

# 1.9.1.4 Wiring Diagrams

Three copies of point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote FMCU, initiating circuits, switches, relays, and terminals, including pathway diagrams between the control unit and shared communications equipment within the protected premises. Point-to-point wiring diagrams must be job specific and must not indicate connections or circuits not being utilized. Provide complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Include a color-code schedule for the wiring.

# 1.9.1.5 System Layout

Three copies of plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, conduit sizes, wire counts, conduit fill calculations, wire color-coding, circuit identification in each conduit, and circuit layouts for all floors. Indicate candela rating of each visual notification appliance. Indicate the wattage of each speaker. Clearly identify the locations of isolation modules. Indicate the addresses of all devices, modules, relays, and similar. Show/identify all acoustically similar spaces. Indicate if the environment for the FMCU is within its environmental listing (e.g., temperature/humidity).

Provide a complete description of the system operation in matrix format similar to the "Typical Input/Output Matrix" included in the Annex of NFPA 72.

### 1.9.1.6 Notification Appliances

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances. Annotate data for each circuit on the drawings.

# 1.9.1.7 Initiating Devices

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

# 1.9.1.8 Amplifiers

Calculations and supporting data to indicate that amplifiers have sufficient capacity to simultaneously drive all notification speakers at tapped settings plus 25 percent spare capacity. Annotate data for each circuit on the drawings.

# 1.9.1.9 Battery Power

Calculations and supporting data as required in paragraph Battery Power Calculations for alarm, alert, and supervisory power requirements. Calculations including ampere-hour requirements for each system component and each control unit component, and the battery recharging period, must be included on the drawings.

# 1.9.1.10 Voltage Drop Calculations

Voltage drop calculations for each notification circuit indicating that sufficient voltage is available for proper operation of the system and all components, at a minimum rated voltage of the system operating on batteries. Include the calculations on the system layout drawings.

# 1.9.1.11 Product Data

Three copies of annotated descriptive data to show the specific model, type, and size of each item. Catalog cuts must also indicate the NRTL listing. The data must be highlighted to show model, size, and options that are intended for consideration. Data must be adequate to demonstrate compliance with all contract requirements. Product data for all equipment must be combined into a single submittal.

Provide an equipment list identifying the type, quantity, make, and model number of each piece of equipment to be provided under this submittal. The equipment list must include the type, quantity, make and model of spare equipment. Types and quantities of equipment submitted must coincide with the types and quantities of equipment used in the battery calculations and those shown on the shop drawings.

# 1.9.1.13 Operation and Maintenance (O&M) Instructions

Six copies of the Operation and Maintenance Instructions. The O&M Instructions must be prepared in a single volume or in multiple volumes, with each volume indexed, and may be submitted as a Technical Data Package. Manuals must be approved prior to training. The Interior Fire Alarm and Mass Notification System Operation and Maintenance Instructions must include the following:

- a. "Manufacturer Data Package five" as specified.
- b. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual must include the manufacturer's name, model number, service manual, parts list, and preliminary equipment list complete with description of equipment and their basic operating features.
- c. Maintenance manual listing routine maintenance procedures, possible breakdowns, and repairs, and troubleshooting guide. The manuals must include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.
- d. Complete procedures for system revision and expansion, detailing both equipment and software requirements.
- e. Software submitted for this project on CD/DVD media utilized.
- f. Printouts of configuration settings for all devices.
- g. Routine maintenance checklist. The routine maintenance checklist must be arranged in a columnar format. The first column must list all installed devices, the second column must state the maintenance activity or state no maintenance required, the third column must state the frequency of the maintenance activity, and the fourth column provided for additional comments or reference. All data (devices, testing frequencies, and similar) must comply with UFC 3-601-02.
- h. A final Equipment List must be submitted with the Operating and Maintenance (O&M) manual.

# 1.9.1.14 As-Built Drawings

The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Owner's test of the system. At least one set of the as-built (marked-up) drawings must be provided at the time of, or prior to the final Owner test.

### 1.9.2 Qualifications

# 1.9.2.1 Design Services

The fire alarm/mass notification system shall require a QFPE to produce the design and shop drawings with a professional stamp. QFPE must be registered in Alabama.

# 1.9.2.2 Fire Alarm System Designer

The fire alarm system designer must be certified as a Level III (minimum) Technician by National Institute for Certification in Engineering Technologies (NICET) in the Fire Alarm Systems subfield of Fire Protection Engineering Technology or meet the qualifications for a QFPE.

# 1.9.2.3 Supervisor

A NICET Level III fire alarm technician must supervise the installation of the fire alarm/mass notification system. The fire alarm technicians supervising the installation of equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

### 1.9.2.4 Technician

Fire alarm technicians with a minimum of four years of experience must be utilized to install and terminate fire alarm/mass notification devices, cabinets, and control units. The fire alarm technicians installing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

# 1.9.2.5 Installer

NICET Level II technician to assist in the installation of fire alarm/mass notification devices, cabinets, and control units. A licensed electrician must be allowed to install wire, cable, conduit and backboxes for the fire alarm system/mass notification system. The fire alarm installer must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

# 1.9.2.6 Test Technician

Fire alarm technicians with a minimum of eight years of experience and NICET Level III or IV utilized in testing and certification of the installation of the fire alarm/mass notification devices, cabinets, and control units. The fire alarm technicians testing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment installed as part of this project.

#### 1.9.2.7 Manufacturer

Components must be of current design and must be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as specified herein.

# 1.9.3 Regulatory Requirements

Equipment and material must be listed or approved. Listed or approved, as used in this section, means listed, labeled, or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of any item of equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation must be considered as mandatory requirements.

# 1.10 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

### 1.11 MAINTENANCE

### 1.11.1 Spare Parts

Furnish the following spare parts in the manufacturers original unopened containers:

- a. Five complete sets of system keys.
- b. Two of each type of fuse required by the system.
- c. One manual station.
- d. Two of each type of detector installed.
- e. Two of each type of audible and visual alarm device installed.
- f. Two of each type of addressable monitor module installed.
- g. Two of each type of addressable control module installed.
- h. Two low voltage, one ethernet and one 120 VAC surge protective device.

### 1.11.2 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment must be furnished to the Owner.

# 1.12 WARRANTY

Warranty all materials, installation, and workmanship for a three (3) year period, unless otherwise specified. Warranty period shall start at the Owner's acceptance. A copy of the manufacturer's warranty shall be provided with the close out documentation.

# PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

# 2.1.1 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory and listed for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment must be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening.

# 2.1.2 Nameplates

Major components of equipment must have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new name plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

- a. FMCU
- b. NAC Panels

Nameplates must be etched metal or plastic, permanently attached by screws to control units or adjacent walls.

# 2.1.3 Keys

Keys and locks for equipment, control units and devices must be identical. Master all keys and locks to a single key as required by the owner.

### 2.1.4 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FMCU. The card must show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions must also include procedures for operating live voice microphones. The instructions and their mounting location must be approved by the owner before being posted.

# 2.2 FIRE ALARM AND MASS NOTIFICATION CONTROL UNIT

Provide a complete fire alarm and mass notification control unit (FMCU) fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care, maintenance, and use of the system must be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control unit, the unit cabinets must match exactly. Fire alarm and mass notification units do not have to be of the same manufacturer, but must operate as one complete operational unit. The system must be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as independent smoke detection systems and relays for output function actuation.

- a. Each control unit must provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit must be suitable for operation on a 120-volt, 60 hertz, normal building power supply. Provide each control unit with supervisory functions for power failure, internal component placement, and operation.
- b. Visual indication of alarm, supervisory, or trouble initiation on the FMCU must be by liquid crystal display or similar means with a minimum of 80 characters. The mass notification control unit must have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages.

c. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight prerecorded messages. Provide the ability to automatically repeat prerecorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, initiate/synchronize strobes and initiate textual visual notification appliances. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

# 2.2.1 Cabinet

Install control unit components in cabinets large enough to accommodate all components and to allow ample gutter space for interconnection of control units as well as field wiring. The cabinet must be a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions. The enclosure must be identified by an engraved phenolic resin nameplate. Lettering on the nameplate must say "Fire Alarm and Mass Notification control unit" and must not be less than 1-inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches.

# 2.2.2 Silencing Switches

# 2.2.2.1 Alarm Silencing Switch

Provide an alarm silencing switch at the FMCU that must silence the audible and visual notification appliances. Subsequent activation of initiating devices must cause the notification appliances to reactivate.

# 2.2.2.2 Supervisory/Trouble Silencing Switch

Provide supervisory and trouble silencing switch(es) that must silence the audible trouble and supervisory signal(s), but not extinguish the visual indicator. This switch must be overridden upon activation of a subsequent supervisory or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated if the supervisory or trouble condition still exists.

# 2.2.3 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Initiating devices must be manually reset by switch from the FMCU after the initiating device or devices have been restored to normal.

# 2.2.4 Audible Notification System

The Audible Notification System must comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements, except as specified herein. The system must be a one-way, multi-channel voice notification system incorporating user selectability of a minimum eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of recorded messages. Audible appliances must produce a three-pulse temporal pattern for three cycles followed by a voice message that is repeated until the control unit is reset or silenced. For carbon monoxide detector activation, audible appliances must produce a four-pulse temporal pattern for three cycles followed by a voice message that is repeated until the control unit is reset or silenced. Automatic messages must be broadcast through speakers throughout the building/facility but not in stairs or

elevator cabs. A live voice message must override the automatic audible output through use of a microphone input at the control unit or the LOC.

- a. When using the microphone, live messages must be broadcast throughout the entire facility. The system must be capable of operating all speakers at the same time.
- b. The microprocessor must actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative must automatically cause the three-pulse temporal pattern to take over all functions assigned to the failed unit in the event an alarm is activated.

### 2.2.4.1 Outputs and Operational Modules

All outputs and operational modules must be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form "C" contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliance during trouble conditions. During a Mass Notification event, the control unit must not generate nor cause any trouble alarms to be generated with the Fire Alarm system.

# 2.2.4.2 Mass Notification

- a. The system must have the capability of utilizing an LOC with redundant controls of the FMCU. Notification Appliance Circuits (NAC) must be provided for the activation of strobe appliances. Audio output must be selectable for line level. A hand-held microphone must be provided and, upon activation, must take priority over any tone signal, recorded message, or PA microphone operation in progress, while maintaining the strobe NAC circuit activation.
- b. The Mass Notification functions must override the manual or automatic fire alarm notification, and public address (PA) functions. Other fire alarm functions including transmission of a signal(s) to the monitoring agency must remain operational. When a mass notification announcement is disengaged and a fire alarm condition still exists, the audible and visual notification appliances must resume activation for alarm conditions. The fire alarm message must be of lower priority that all other messages (except any "test" messages) and must not override any other messages.
- c. Messages shall utilize a professional voice and match the owner's standards and Alabama National Guard standards.

# 2.2.5 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long-life batteries, capacitors, or other age-dependent devices must not be considered as equal to non-volatile processors, PROMS, or EPROMS.

# 2.2.6 Field Programmability

Provide control units and control units that are fully field programmable for both input and output of control, initiation, notification, supervisory, and trouble functions. The system program configuration must be menu driven. System changes must be password protected. Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system must be provided as part of this contract.

# 2.2.7 Input/Output Modifications

The FMCU must contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features must consist of a control unit mounted keypad. Any bypass or modification to the system must indicate a trouble condition on the FMCU.

# 2.2.8 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

### 2.2.9 Walk Test

The FMCU must have a walk test feature. When using this feature, operation of initiating devices must result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated in the history log, but no other outputs occur.

# 2.2.10 History Logging

The control unit must have the ability to store a minimum of 400 events in a log. These events must be stored in a battery-protected memory and must remain in the memory until the memory is downloaded or cleared manually. Resetting of the control unit must not clear the memory.

# 2.2.11 Manual Access

An operator at the control unit, having a proper access level, must have the capability to manually access the following information for each initiating device.

- a. Primary status.
- b. Device type.
- c. Present average value.
- d. Present sensitivity selected.
- e. Detector range (normal, dirty).

# 2.2.12 Heat Detector Self-Test Routines

Automatic self-test routines must be performed on each detector that will functionally check detector sensitivity electronics and ensure the accuracy of the value being transmitted. Any detector that fails this test must indicate a trouble condition with the detector location at the control unit.

# 2.3 LOCAL OPERATING CONSOLES (LOC)

# 2.3.1 General

The LOC must consist of a remote microphone station incorporating a push-to-talk (PTT) hand-held microphone and system status indicators. The LOC must have the capability of being utilized to activate prerecorded messages. The unit must incorporate microphone override of any tone generation or recorded messages. The unit must be fully supervised from the FMCU. The housing for the LOC must not be lockable. The LOC must have public address capability with the provision of a separate microphone. The PA paging function must not override any alarm or notification functions. The PA microphone must be hand-held style. Hand-held microphones must be housed in a separate protective cabinet. The cabinet must be accessible without the use of a key. The location of the microphone must be approved by the Fire Protection Authority Having Jurisdiction (FPAHJ). Activation of the PA microphone must not initiate activation of visual notification appliances. The PA paging function must not override any alarm or notification functions.

### 2.4 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 must be housed in a remote FMCU, terminal cabinet, or in the FMCU. Individual amplifiers must be 100 watts maximum.

## 2.4.1 Operation

The system must automatically operate and control all building speakers.

## 2.4.2 Construction

Amplifiers must utilize computer grade solid state components and must be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

### 2.4.3 Inputs

Equip each system with separate inputs for the tone generator, digitalized voice driver and control unit mounted microphone Public Address Paging Function. Microphone inputs must be of the low impedance, balanced line type. Both microphone and tone generator input must be operational on any amplifier.

### 2.4.4 Tone Generator

The tone generator must produce a three-pulse temporal pattern and must be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. The tone generator must be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and causes transfer of the common trouble relay. The tone generator must be provided with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces.

### 2.4.5 Protection Circuits

Each amplifier must be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component must cause illumination of a visual "amplifier trouble" indicator on the control unit, appropriate logging of the condition in the history log, and other actions for trouble conditions as specified.

## 2.5 REMOTE ANNUNCIATOR

## 2.5.1 LCD Annunciator

Provide a semi-recessed mounted annunciator that includes an LCD display. The display must indicate the device in trouble/alarm or any supervisory device. Display the device name and address. The remote annunciator must duplicate functions of the FMCU for message display, fire alarm, supervisory alarm, and trouble conditions, visual and audible notification, and system reset functions. Remote annunciator must require the use of a key for accessing the reset, control, and other functions.

A building floor plan must be provided and mounted (behind Plexiglass or similar protective material) at the annunciator location. The floor plan must indicate all rooms by name and number including the locations of stairs and elevators. The floor plan must show all devices and their programmed address to facilitate identification of their physical location from the LCD display information.

## 2.5.2 Annunciator

## 2.5.2.1 Materials

Construct the graphic annunciator face plate of smoked Plexiglas. The face plate must be backlit with LEDs. Control equipment and wiring must be housed in a surface mounted back box. The exposed portions of the back box must be anodized aluminum without knockouts.

## 2.5.2.2 Programming

Where programming for the operation of the graphic annunciator is accomplished by a separate software program other than the software for the FMCU, the software program must not require reprogramming after loss of power. The software must be reprogrammable in the field.

### 2.6 MANUAL STATIONS

Provide metal or plastic, semi-flush mounted, double-action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations must be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations must be finished in red with molded raised lettering operating instructions of contrasting color. The use of a key must be required to reset the station.

## 2.7 SMOKE DETECTORS

## 2.7.1 Spot Type Detectors

Provide addressable photoelectric smoke detectors as follows:

- a. Provide analog/addressable photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors must be listed for use with the FMCU.
- b. Provide self-restoring type detectors that do not require any readjustment after actuation at the FMCU to restore them to normal operation. The detector must have a visual indicator to show actuation.
- c. Vibration must have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen must not inhibit the movement of smoke particles into the chamber.
- d. Provide twist lock bases with screw terminals for each conductor. The detectors must maintain contact with their bases without the use of springs.
- e. The detector address must identify the particular unit, its location within the system, and its sensitivity setting. Detectors must be of the low voltage type rated for use on a 27.4 VDC system.

## 2.7.2 Duct Smoke Detectors

Duct-mounted addressable photoelectric smoke detectors must consist of a smoke detector, as specified in paragraph Spot Type Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry must be mounted in a metallic or plastic enclosure exterior to the duct. It is not permitted to cut the duct insulation to install the duct detector directly on the duct. Detectors must be

listed for operation over the complete range of air velocities, temperature and humidity expected at the detector when the air-handling system is operating. Detectors must be powered from the FMCU.

- a. Sampling tubes must run the full width of the duct. The duct detector package must conform to the requirements of NFPA 90A, UL 268A, and must be listed for use in air-handling systems. The control functions, operation, reset, and bypass must be controlled from the FMCU.
- b. Lights to indicate the operation and alarm condition must be visible and accessible with the unit installed and the cover in place. Remote indicators must be provided where required by NFPA 72. Remote indicators as well as the affected fan units must be properly identified in etched plastic placards.
- c. Detectors must provide for control of auxiliary contacts that provide control, interlock, and shutdown functions. Auxiliary contacts provide for this function must be located within 3 feet of the controlled circuit or appliance. The auxiliary contacts must be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

### 2.9 HEAT DETECTORS

### 2.9.1 Heat Detectors

Heat detectors must be analog/addressable and designed for detection of fire by fixed temperature in accordance with UL 521. The alarm condition must be determined by comparing detector value with the stored values. Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, must be types approved for such locations.

## 2.9.1.1 Fixed Temperature Detectors

Detectors must be surface mounted in the horizontal orientation and supported independently of wiring connections. Detectors must be self-restoring. The detectors must have a specific temperature setting of 135 degrees F.

## 2.10 MULTI-CRITERIA DETECTORS

Multi-criteria detectors must contain fixed temperature 135 degrees F heat sensor, and carbon monoxide sensor elements in a single housing.

## 2.11 CARBON MONOXIDE DETECTOR

Analog/addressable carbon monoxide (CO) detectors must be listed to UL 2075 and set to respond to the sensitivity limits of UL 2034. Carbon monoxide detectors must be listed for use with fire alarm control units. Detectors must be surface mounted in the horizontal orientation and supported independently of wiring connections. Detectors must be self-restoring. For FMCU with no listed compatible addressable CO detectors, provide listed 4-wire detectors. Do not provide CO detectors with local alarms. Detector must be provided with an LED status indicator.

- a. Where 4-wire CO detectors are necessary, each 4-wire CO detector must be individually monitored via addressable interface modules for alarm and off normal/trouble conditions (including loss of power to the individual detector). Power circuits for 4-wire CO detectors must be dedicated to powering the CO detectors only. Battery powered and 120 VAC powered detectors are prohibited.
- b. Wiring connections must be made by means of screw terminals and detectors must be equipped with trouble relays. Detectors must be able to mount a single-gang electrical box.

- c. A trouble condition at an individual CO detector must not affect any other CO detectors. CO detectors must be powered by the FMCU.
- d. Detectors must be provided with a means to test CO gas entry into the CO sensing cell.

### 2.12 NOTIFICATION APPLIANCES

### 2.12.1 Audible Notification Appliances

Audible appliances must conform to the applicable requirements of UL 464. Appliances must be connected into notification appliance circuits. Surface mounted audible appliances must be painted red. Recessed audible appliances must be installed with a grill that is painted red with a factory finish to match the surface to which it is mounted.

## 2.12.1.1 Speakers

- a. Speakers must conform to the applicable requirements of UL 1480. Speakers must have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Interior speaker tap settings must include taps of 1/4, 1/2, 1, and 2 watts, at a minimum. Exterior speakers must also be multi-tapped with no more than 15-watt maximum setting. Speakers must incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400 Hz to 4,000 Hz, and must have a sealed back construction. Speakers must be capable of installation on standard 4-inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall mounted unit. All inputs must be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FMCU.
- b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gage or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes must be ground and finished to provide a smooth and neat appearance for each plate. Each plate must be primed and painted.
- c. Speakers must utilize screw terminals for termination of all field wiring.

## 2.12.2 Visual Notification Appliances

Visual notification appliances must conform to the applicable requirements of UL 1638, UL 1971 and conform to the Architectural Barriers Act (ABA). Visual Notification Appliances must have clear high intensity optic lens, xenon flash tubes, or light emitting diode (LED) and be marked "Alert" in letters of contrasting color. Strobes are to be used for fire alarm and mass notification. The light pattern must be dispersed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate must be 1 flash per second and a minimum of 15 candela based on the UL 1971 test. Strobe must be semi-flush mounted.

## 2.13 ELECTRIC POWER

## 2.13.1 Primary Power

Power must be 120 VAC 60 Hz service for the FMCU from the AC service to the building in accordance with NFPA 72.

## 2.14 SECONDARY POWER SUPPLY

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power must be automatic and must not cause transmission of a false alarm.

#### 2.14.1 Batteries

Provide sealed, maintenance-free, sealed lead acid batteries as the source for emergency power to the FMCU. Batteries must contain suspended electrolyte. The battery system must be maintained in a fully charged condition by means of a solid-state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.

## 2.14.1.1 Capacity

Battery size must be the greater of the following two capacities. This capacity applies to every control unit associated with this system, including supplemental notification appliance circuit panels, auxiliary power supply panels, fire alarm transceivers, and Base-wide mass notification transceivers. When determining the required capacity under alarm condition, visual notification appliances must include both textual and non-textual type appliances.

- a. Sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.
- b. Sufficient capacity to operate the mass notification for 60 minutes after loss of AC power.

## 2.14.1.2 Battery Power Calculations

- a. Verify that battery capacity exceeds supervisory and alarm power requirements for the criteria noted in the paragraph "Capacity" above.
  - (1) Substantiate the battery calculations for alarm and supervisory power requirements. Include ampere-hour requirements for each system component and each control unit component, and compliance with UL 864.
  - (2) Provide complete battery calculations for both the alarm and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.
  - (3) Provide voltage drop calculations to indicate that sufficient voltage is available for proper operation of the system and all components. Calculations must be performed using the minimum rated voltage of each component.
- b. For battery calculations assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required Amp-Hours for the specified standby time, and then calculate the required Amp-Hours for the specified alarm time. Using 20.4 VDC as starting voltage, perform a voltage drop calculation for circuits containing device and/or appliances remote from the power sources.

## 2.14.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger must be capable of providing 120 percent of the connected system load and must maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger must recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high-rate switch is provided.

## 2.15 SURGE PROTECTIVE DEVICES

Surge protective devices must be provided to suppress all voltage transients which might damage fire alarm control unit components. Systems having circuits located outdoors, communications equipment must be protected against surges induced on any signaling line circuit. Cables and conductors, that serve as communications links, must have surge protection circuits installed at each end. The surge protective device must wire in series to the power supply of the protected equipment with screw terminations. Line voltage surge arrestor must be installed directly adjacent to the power panel where the FMCU breaker is located.

- a. Surge protective devices for nominal 120 VAC must be UL 1449 listed with a maximum 500-volt suppression level and have a maximum response time of 5 nanoseconds. The surge protective device must also meet IEEE C62.41.1 and IEEE C62.41.2 category B tests for surge capacity. The surge protective device must feature multi-stage construction and be provided with a long-life indicator lamp (either light emitting diode or neon) which extinguishes upon failure of protected components. Any unit fusing must be externally accessible.
- b. Surge protective devices for nominal 24 VAC, fire alarm cellular communicator, or fire alarm telephone dialer must be UL 497B listed, meet IEEE C62.41.1 and have a maximum response time of 1-nanosecond. The surge protective device must feature multi-stage construction and be self-resetting. The surge protective device must be a base and plug style. The base assembly must have screw terminals for fire alarm wiring. The base assembly must accept "plug-in" surge protective module.
- c. All surge protective devices (SPD) must be the standard product of a single manufacturer and be equal or better than the following:
  - (1) For 120 VAC nominal line voltage: UL 1449 and UL 1283 listed, series connected 120 VAC, 20A rated, surge protective device in a NEMA 4x enclosure. Minimum 50,000-amp surge current rating with EMI/RFI filtering and a dry contact circuit for remote monitoring of surge protection status.
  - (2) For 24-volt nominal line voltage: UL 497B listed, series connected low voltage, 24-volt, 5A rated, loop circuit protector, base, and replaceable module.
  - (3) For alarm cellular communicators: UL 497A listed, series connected, 130-volt, 150 mA rated with self-resetting fuse, dialer circuit protector with modular plug and play.
  - (4) For fiber connections: UL 497B listed, series connected, 6.4-volt, 1.5A rated with 20 kA/pair surge current, data network protector with modular plug and play.

## 2.16 WIRING

Provide wiring materials under this section as specified in Section 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES and Section 26 05 23 CONTROL-VOLTAGE ELECTRICAL POWER CABLES with the additions and modifications specified herein.

## 2.16.1 Alarm Wiring

IDC and SLC wiring must be solid copper cable in accordance with the manufacturer's requirements. Copper signaling line circuits and initiating device circuit field wiring must be No. 16 AWG size conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, must be copper No. 14 AWG size conductors at a minimum. Speaker circuits must be copper No. 16 AWG size twisted and shielded conductors at a minimum. Wire size must be sufficient

to prevent voltage drop problems. Circuits operating at 24 VDC must not operate at less than the listed voltages for the detectors and/or appliances. Power wiring, operating at 120 VAC minimum, must be a minimum No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as appropriate with red colored covering. Nonpower-limited cables must comply with NFPA 70. All wiring between devices must be splice free.

#### 2.17 INTERFACE TO MONTORING AGENCIES

The fire alarm / mass notification system shall report all conditions to entities with 24HR monitoring capabilities. These entities shall receive final approval by the Owner.

### 2.17.1 Cellular Communicator

A cellular communicator must be provided for communication with the monitoring agencies and shall be compatible with the proprietary monitoring system equipment. The cellular modem must be compatible with 4G and 3G networks and utilize a GSM style communicator. The modem must be capable of auto dialing a preset number based on pre-programmed events. The modem must auto answer and provide a secure password protection system The cellular communicator shall be housed in a separate lockable enclosure. The remote antenna shall be 3dB gain and be an external remote type mounted on the roof. Cabling: as specified in Section 27 05 33 RACEWAYS, BOXES, AND CABLING FOR COMMUNICATION SYSTEMS.

## 2.17.2 Telephone

A modem must be provided for communication with the monitoring agencies and shall be compatible with the proprietary monitoring system equipment. The modem must be 56k, compatible with data mode V.90, utilizing Hayes compatible command codes. The modem must be capable of auto dialing a preset number based on pre-programmed events. The modem must auto answer and provide a secure password protection system. Provide a dedicated phone line per reporting agency. Cabling: as specified in Section 27 05 33 RACEWAYS, BOXES, AND CABLING FOR COMMUNICATION SYSTEMS.

## 2.17.3 Signals to Be Transmitted to the Monitoring Agency Station

See contract drawings fire alarm matrix for signals to be transmitted.

## 2.18 ENVIRONMENTAL ENCLOSURES OR GUARDS

Environmental enclosures must be provided to permit fire alarm/mass notification components to be used in areas that exceed the environmental limits of the listing. The enclosure must be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the component is currently listed. Guards required to deter mechanical damage must be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

## PART 3 EXECUTION

## 3.1 VERIFYING ACTUAL FIELD CONDITIONS

Before commencing work, examine all adjoining work on which the contractor's work is in any way dependent for perfect workmanship according to the intent of this specification section, and report to the Fire Protection Authority Having Jurisdiction (FPAHJ) any condition which prevents performance of first-class work. No "waiver of responsibility" for incomplete, inadequate, or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

## 3.2 INSTALLATION

## 3.2.1 Fire Alarm and Mass Notification Control Unit (FMCU)

Locate the FMCU where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 6 feet above the finished floor or center the cabinet at 5 feet, whichever is lower. Conductor terminations must be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection must be permanently mounted in the FMCU. Locate the document storage cabinet adjacent to the FMCU unless the Contracting Officer directs otherwise.

## 3.2.2 Battery Cabinets

When batteries will not fit in the FMCU, locate battery cabinets below or adjacent to the FMCU. Battery cabinets must be installed at an accessible location when standing at floor level. Battery cabinets must not be installed lower than 12 inches above finished floor, measured to the bottom of the cabinet, nor higher than 36 inches above the floor, measured to the top of the cabinet. Installing batteries above drop ceilings or in inaccessible locations is prohibited. Battery cabinets must be large enough to accommodate batteries and to allow ample gutter space for interconnection of control units as well as field wiring. The cabinet must be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions. The cabinet must be identified by an engraved phenolic resin nameplate. Lettering on the nameplate must indicate the control unit(s) the batteries power and must not be less than 1-inch high.

## 3.2.3 Manual Stations

Locate manual stations as required by NFPA 72 and as indicated on the drawings. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally. Manual stations must be mounted at 48 inches measured to the operating handle.

## 3.2.4 Notification Appliances

- a. Locate notification appliance devices as required by NFPA 72 where indicated and to meet the intelligibility requirements. Where two or more visual notification appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices must use screw terminals for all field wiring. Audible and visual notification appliances mounted in acoustical ceiling tiles must be centered in the tiles plus or minus 2 inches.
- b. Audible and visual notification appliances mounted on the exterior of the building, within unconditioned spaces, or in the vicinity of showers must be listed weatherproof appliances installed on weatherproof backboxes.
- c. Speakers must not be in close proximity to the FMCU or LOC so as to cause feedback when the microphone is in use.

## 3.2.5 Smoke and Heat Detectors

Locate detectors as required by NFPA 72 and their listing as indicated on the drawings on a 4-inch mounting box. Install heat detectors not less than 4 inches from a side wall to the near edge. Heat detectors located on the wall must have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. Smoke detectors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 3 feet from air handling supply diffusers. Detectors installed in acoustical ceiling tiles must be centered in the tiles plus or minus 2 inches.

## 3.2.6 Carbon Monoxide Detectors

Locate detectors as required by NFPA 72 and their listings as indicated on the drawings on a 4-inch mounting box. Carbon monoxide detectors must be installed separate from smoke and/or heat detectors.

### 3.2.7 LCD REMOTE Annunciator

Locate the LCD annunciator as shown on the drawings. Mount the annunciator, with the top 6 feet above the finished floor or center the annunciator at 5 feet, whichever is lower.

### 3.2.8 Local Operating Console (LOC)

Locate the LOC(s) as required by NFPA 72 and as indicated. Mount the console so that the top message button and microphone is no higher than 4 feet above the floor and the bottom (lowest) message button and microphone is at least 3 feet above the finished floor.

## 3.2.9 Ceiling Bridges

Provide ceiling bridges for ceiling-mounted appliances. Ceiling bridges must be as recommended/required by the manufacturer of the ceiling-mounted notification appliance.

# 3.3 SYSTEM FIELD WIRING

### 3.3.1 Wiring within Cabinets, Enclosures, and Boxes

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box must be connected to screwtype terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Wiring to conform with NFPA 70.

Indicate the following in the wiring diagrams:

- a. Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote fire alarm/mass notification control units, initiating circuits, switches, relays and terminals.
- b. Complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

## 3.3.2 Terminal Cabinets

Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Terminal size must be appropriate for the size of the wiring to be connected. Conductor terminations must be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection must be permanently mounted in the terminal cabinet. Minimum size is 8 inches by 8 inches. Only screw-type terminals are permitted. Provide an identification label, that displays "FIRE ALARM TERMINAL CABINET" with 2-inch lettering, on the front of the terminal cabinet.

## 3.3.3 Alarm Wiring

- a. Voltages must not be mixed in any junction box, housing, or device, except those containing power supplies and control relays.
- b. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point, in or adjacent to the FMCU.
- c. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited.
- d. Color coding is required for circuits and must be maintained throughout the circuit. Conductors used for the same functions must be similarly color coded. Conform wiring to NFPA 70.
- e. Pull all conductors splice free. The use of wire nuts, crimped connectors, or twisting of conductors is prohibited.

### 3.3.4 Back Boxes and Conduit

In addition to the requirements of Section 26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYISTEMS, provide all wiring in rigid metal conduit or intermediate metal conduit unless specifically indicated otherwise. Minimum conduit size must be 3/4-inch in diameter. Do not use electrical non-metallic tubing (ENT) or flexible non-metallic tubing and associated fittings.

- a. Galvanized rigid steel (GRS) conduit must be utilized where exposed to weather, where subject to physical damage, and where exposed on exterior of buildings. Intermediate metal conduit (IMC) may be used in lieu of GRS as allowed by NFPA 70.
- b. Electrical metallic tubing (EMT) is permitted above suspended ceilings or exposed where not subject to physical damage. Do not use EMT underground, encased in concrete, mortar, or grout, in hazardous locations, where exposed to physical damage, outdoors or in fire pump rooms. Use die-cast compression connectors.
- c. For rigid metallic conduit (RMC), only threaded type fitting are permitted for wet or damp locations.
- d. Flexible metal conduit is permitted for initiating device circuits 6 feet in length or less. Flexible metal conduit is prohibited for notification appliance circuits and signaling line circuits. Use liquid tight flexible metal conduit in damp and wet locations.
- e. Schedule 40 (minimum) polyvinyl chloride (PVC) is permitted where conduit is routed underground or underground below floor slabs. Convert non-metallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before turning up through floor slab.
- f. Exterior wall penetrations must be weathertight. Conduit must be sealed to prevent the infiltration of moisture.
- g. For Class "A" or "X" circuits with conductor lengths of 10 feet or less, the conductors must be permitted to be installed in the same raceway in accordance with NFPA 72.

### 3.3.5 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FMCU and the LOC must be provided at each conductor connection. Each conductor or cable must have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FMCU, and remote FMCU must contain a

laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing must be neat, using 12-point lettering minimum size, and mounted within each cabinet, control unit, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

#### 3.7 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire-rated walls, partitions with fire-rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00 FIRESTOPPING.

### 3.8 PAINTING

- a. In unfinished areas (including areas above drop ceilings), paint all exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceway, junction boxes and covers red. In lieu of painting conduit, the contractor may utilize red conduit with a factory applied finish.
- b. In finished areas, paint exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceways, junction boxes, and electrical boxes to match adjacent finishes. The inside cover of the junction box must be identified as "Fire Alarm" and the conduit must have painted red bands 3/4-inch wide at 10-foot centers and at each side of a floor, wall, or ceiling penetration.
- c. Painting must comply with painting requirements.

#### 3.9 FIELD QUALITY CONTROL

### 3.9.1 Test Procedures

Submit detailed test procedures, prepared and signed by the NICET Level III or IV Fire Alarm Technician, and the representative of the installing company, and reviewed by the QFPE 60 days prior to performing system tests. Detailed test procedures must list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, and surge protective devices. Test procedures must include sequence of testing, time estimate for each test, and sample test data forms. The test data forms must be in a check-off format (pass/fail with space to add applicable test data; similar to the forms in NFPA 72 and NFPA 4.) The test procedures and accompanying test data forms must be used for the pre-owner testing and the owner testing. The test data forms must record the test results and must:

- a. Identify the NFPA Class of all Initiating Device Circuits (IDC), and Notification Appliance Circuits (NAC), Voice Notification System Circuits (NAC Audio), and Signaling Line Circuits (SLC).
- b. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component and describe how these tests must be performed.
- c. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.
- d. Identify all test equipment and personnel required to perform each test (including equipment necessary for smoke detector testing. The use of magnets is not permitted.

e. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

## 3.9.2 Pre-Owner Testing

## 3.9.2.1 Verification of Compliant Installation

Conduct inspections and tests to ensure that devices and circuits are functioning properly. Tests must meet the requirements of paragraph entitled "Minimum System Tests" as required by NFPA 72. The contractor and an authorized representative from each supplier of equipment must be in attendance at the pre-Owner testing to make necessary adjustments. After inspection and testing is complete, provide a signed Verification of Compliant Installation letter by the QFPE that the installation is complete, compliant with the specification and fully operable. The letter must include the names and titles of the witnesses to the pre-Owner tests. Provide all completion documentation as required by NFPA 72 including all referenced annex sections and the test reports noted below.

- a. NFPA 72 Record of Completion.
- b. NFPA 72 Record of Inspection and Testing.
- c. Fire Alarm and Emergency Communication System Inspection and Testing Form.
- d. Audibility test results with marked-up test floor plans.
- e. Intelligibility test results with marked-up floor plans.
- f. Documentation that all tests identified in the paragraph "Minimum System Tests" are complete.

## 3.9.2.2 Request for Owner Final Test

When the verification of compliant installation has been completed, submit a formal request for the Owner's final test to the Architect. Owner final testing will not be performed until after the connections to the installation-wide fire reporting system and the installation-wide mass notification system have been completed and tested to confirm communications are fully functional. Submit request for test at least 15 calendar days prior to the requested test date.

## 3.9.3 Correction of Deficiencies

If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary, until the system has been demonstrated to comply with all contract requirements.

## 3.9.4 Owner Final Tests

The tests must be performed in accordance with the approved test procedures in the presence of the Fire Protection Authority Having Jurisdiction (FPAHJ) and the QFPE. Furnish instruments and personnel required for the tests. The following must be provided at the job site for Owner Final Testing:

- a. The manufacturer's technical representative.
- b. Marked-up red line drawings of the system as actually installed.
- c. Loop resistance test results.

- d. Complete program printout including input/output addresses.
- e. Copy of pre-Owner Test Certificate, test procedures and completed test data forms.
- f. Audibility test results with marked-up floor plans.
- g. Intelligibility test results with marked-up floor plans.

Owner Final Tests will be witnessed by the Fire Protection Authority Having Jurisdiction (FPAHJ) and the QFPE. At this time, any and all required tests noted in the paragraph "Minimum System Tests" must be repeated at their discretion.

### 3.10 MINIMUM SYSTEM TESTS

### 3.10.1 System Tests

Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:

- a. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests must be witnessed by the Owner's representative and test results recorded for use at the final Owner test.
- b. Verify the absence of unwanted voltages between circuit conductors and ground. The tests must be accomplished at the pre-owner test with results available at the final system test.
- c. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- d. Test each initiating device and notification appliance and circuit for proper operation and response at the control unit. Smoke detectors must be tested in accordance with manufacturer's recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors must comply with the requirements of NFPA 72 except disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision must be tested at each device.
- e. Carbon Monoxide Detector Tests: Carbon monoxide detectors must be tested in accordance with NFPA 72 and the manufacturer's recommended calibrated test method.
- f. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.
- g. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.
- h. Determine that the system is operable under trouble conditions as specified.
- i. Visually inspect wiring.
- j. Test the battery charger and batteries.
- k. Verify that software control and data files have been entered or programmed into the FMCU. Hard copy records of the software must be provided to the owner.
- I. Verify that red-line drawings are accurate.

- m. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
- n. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
- o. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke detectors must be conducted using real smoke or the use of canned smoke which is permitted.
- p. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
- q. Verify the documentation cabinet is installed and contains all as-built shop drawings, product data sheets, design calculations, site-specific software data package, and all documentation required by paragraph titled "Test Reports".

## 3.10.2 Audibility Tests

Sound pressure levels from audible notification appliances must be a minimum of 15 dBa over ambient with a maximum of 110 dBa in any occupiable area. The provisions for audible notification (audibility and intelligibility) must be met with doors, fire shutters, movable partitions, and similar devices closed.

## 3.10.3 Intelligibility Tests

Intelligibility testing of the System must be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, and ASA S3.2. Following are the specific requirements for intelligibility tests:

- a. Intelligibility Requirements: Verify intelligibility by measurement after installation.
- b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is .8. Rounding of values is permitted.
- c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the FPAHJ, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required CIS value within the same area.
- d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.
- e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).
- f. The distance the occupant must walk to the location meeting the minimum required CIS value must be measured on the floor or other walking surface as follows:
  - (1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.
  - (2) Curving around any corners or obstructions, with a 12 inches clearance there from.

(3) Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by NFPA 72 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

### 3.11 SYSTEM ACCEPTANCE

Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Fire Protection Authority Having Jurisdiction (FPAHJ) for review and acceptance. The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Owner's test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the Final Owner's Test.

- a. The drawings must be prepared electronically and sized no less than the contract drawings. Furnish one set of CDs or DVDs containing software back-up and CAD based drawings in latest version of AutoCAD, DXF and portable document formats of as-built drawings and schematics.
- b. Include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.
- c. Include a riser diagram and drawings showing the as-built location of devices and equipment.
- d. Provide Operation and Maintenance (O&M) Instructions.

### 3.12 INSTRUCTION OF OWNER'S EMPLOYEES

## 3.12.1 Instructor

Provide the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the operation, inspection, testing, and maintenance of the system provided. The instructor must train the Owner's employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system. The instructor must be thoroughly familiar with all parts of this installation. The instructor must be trained in operating theory as well as in practical O&M work. Submit the instructor's information and qualifications including the training history.

## 3.12.2 Required Instruction Time

Provide 8 hours of instruction after final acceptance of the system. The instruction must be given during regular working hours on such dates and times selected by the Owner's Representative. The instruction may be divided into two or more periods at the discretion of the Owner's Representative. The training must allow for rescheduling for unforeseen maintenance and/or fire department responses.

## 3.12.2.1 Technical Training

Equipment manufacturer or a factory representative must provide training 1 day on site. Training must allow for classroom instruction as well as individual hands-on programming, troubleshooting and diagnostics exercises. On-site training must occur within 1 month of system acceptance.

## 3.12.3 Technical Training Manual

Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training must familiarize designated Owner's personnel

with proper operation of the installed system. The maintenance training course must provide the designated Owner's personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

### 3.13 EXTRA MATERIALS

## 3.13.1 Repair Service/Replacement Parts

Repair services and replacement parts for the system must be available for a period of 10 years after the date of final acceptance of this work by the Owner's Representative. During the warranty period, the service technician must be on-site within 24 hours after notification. All repairs must be completed within 24 hours of arrival on-site.

During the warranty period, the installing fire alarm contractor is responsible for conducting all required testing and maintenance in accordance with the requirements and recommended practices of NFPA 72 and the system manufacturer. Installing fire alarm contractor is NOT responsible for any damage resulting from abuse, misuse, or neglect of equipment by the end user.

### 3.13.2 Spare Parts

Spare parts furnished must be directly interchangeable with the corresponding components of the installed system. Spare parts must be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts must be delivered to the Owner's Representative at the time of the Owner's testing and must be accompanied by an inventory list.

## 3.13.3 Document Storage Box

Upon completion of the project, but prior to project close-out, place in the document storage box copies of the following:

- a. As-built shop drawings
- b. Product data sheets
- c. Design calculations
- d. Site-specific software data package
- e. All documentation required by Testing Reports.

## **END SECTION**

# SECTION 31 00 00 EARTH MOVING

## **PART 1- GENERAL**

## 1.01 SUMMARY

- A. Section Includes:
  - 1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage course for concrete slabs-on-grade.
  - 4. Subbase course for concrete walks.
  - 5. Subbase course and base course for asphalt paving.
  - 6. Excavating and backfilling for utility trenches.

### 1.02 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

## 1.03 QUALITY ASSURANCE

A. Pre-Excavation Conference: Conduct conference at Project site.

### 1.04 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

### **PART II- PRODUCTS**

### 2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
  - 1. Liquid Limit: 40 max.
  - 2. Plasticity Index: 3 to 14.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of Section 230 of the ALDOT Standard Specifications for Highway Construction.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of Section 230 of the ALDOT Standard Specifications for Highway Construction.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with 100 percent passing a 3-inch sieve and not more than 45 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

## 2.02 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously

- inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

## **PART III- EXECUTION**

## 3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

## 3.02 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

## 3.03 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrowtine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

## 3.04 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

## 3.05 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
  - Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
  - 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

## 3.06 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

### 3.07 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 3000 psi, may be used when approved by Engineer.
  - Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

# 3.08 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

## 3.09 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  - Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- D. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- E. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

## 3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.

## 3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.
  - Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

### 3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698.
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

### 3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1 inch.
  - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

## 3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
  - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
  - 2. Place subbase course and base course that exceeds 8 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 4 inches thick.
  - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent standard density according to ASTM D 698.

## 3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabson-grade as follows:
  - 1. Place drainage course that exceeds 8 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 4 inches thick.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight according to ASTM D 698.

## 3.16 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

## 3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

## 3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION** 

# SECTION 32 13 13.02 CONCRETE PAVING

#### **PART 1 - GENERAL**

### 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - Driveways.
  - 2. Roadways.
  - 3. Parking lots.
  - 4. Curbs and gutters.
  - 5. Walks.

## 1.3 **DEFINITIONS**

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
  - 2. Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.
- C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- D. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- E. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
  - 1. Exposed Aggregate: 10-lb Sample of each mix.
- F. Other Action Submittals:
  - Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:

- 1. Cementitious materials.
- 2. Steel reinforcement and reinforcement accessories.
- 3. Fiber reinforcement.
- Admixtures.
- 5. Curing compounds.
- 6. Applied finish materials.
- 7. Bonding agent or epoxy adhesive.
- 8. Joint fillers.
- C. Material Test Reports: For each of the following:
  - Aggregates.
- D. Field quality-control reports.

### 1.6 QUALITY ASSURANCE

- A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing readymixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual Section 3, "Plant Certification Checklist").
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.
- E. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
  - Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
    - Concrete mixture design.
    - b. Quality control of concrete materials and concrete paying construction practices.
  - 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
    - a. Contractor's superintendent.

- b. Independent testing agency responsible for concrete design mixtures.
- c. Ready-mix concrete manufacturer.
- d. Concrete paving subcontractor.
- e. Manufacturer's representative of stamped concrete paving system used for detectable warnings.

### 1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

### **PART 2 - PRODUCTS**

## 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
  - Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

## 2.2 STEEL REINFORCEMENT

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- D. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- H. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- I. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- J. Deformed-Steel Wire: ASTM A 496/A 496M.
- K. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed.

- L. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- M. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.
- N. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- O. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- P. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- Q. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- R. Zinc Repair Material: ASTM A 780.

## 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, white portland cement Type I or Type II.
  - 2. Normal-Weight Aggregates: per A.L.D.O.T. Specifications, uniformly graded. Provide aggregates from a single source.
- B. Water: Potable and complying with ASTM C 94/C 94M.
- C. Air-Entraining Admixture: ASTM C 260.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

### 2.4 FIBER REINFORCEMENT

Section Omitted

## 2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, [Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
  - 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. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
    - b. BASF Construction Chemicals, LLC; Confilm.
    - c. ChemMasters; Spray-Film.
    - d. Conspec by Dayton Superior; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film (J-74).
    - f. Edoco by Dayton Superior; BurkeFilm.
    - g. Euclid Chemical Company (The), an RPM company; Eucobar.
    - h. Kaufman Products, Inc.; VaporAid.
    - i. Lambert Corporation; LAMBCO Skin.
    - j. L&M Construction Chemicals, Inc.; E-CON.
    - k. Meadows, W. R., Inc.; EVAPRE.
    - I. Metalcrete Industries; Waterhold.
    - m. Nox-Crete Products Group; MONOFILM.
    - n. Sika Corporation, Inc.; SikaFilm.
    - o. SpecChem, LLC; Spec Film.
    - p. Symons by Dayton Superior; Finishing Aid.
    - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
    - r. Unitex; PRO-FILM.
    - s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  - 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. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
    - b. ChemMasters; Safe-Cure Clear.
    - c. Conspec by Dayton Superior; D.O.T. Resin Cure or DSSCC Clear Resin Cure.
    - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
    - e. Edoco by Dayton Superior; DSSCC Clear Resin Cure or Resin Emulsion Cure V.O.C. Type I
    - f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
    - g. Kaufman Products, Inc.; Thinfilm 420.
    - h. Lambert Corporation; AQUA KURE CLEAR.
    - i. L&M Construction Chemicals, Inc.; L&M CURE R.
    - j. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
    - k. Nox-Crete Products Group; Resin Cure E.
    - I. SpecChem, LLC; PaveCure Rez.
    - m. Symons by Dayton Superior; Resi-Chem Clear.
    - n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
    - o. TK Products, Division of Sierra Corporation; TK-2519 WB or TK-2519 DC WB.
    - p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.
  - 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. Anti-Hydro International, Inc.; A-H Curing Compound #2 WP WB.
    - b. ChemMasters; Safe-Cure 2000.

- c. Conspec by Dayton Superior; D.O.T. Resin Cure White or DSSCC White Resin Cure.
- d. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
- e. Edoco by Dayton Superior; Resin Emulsion Cure V.O.C. (Type II).
- f. Euclid Chemical Company (The), an RPM company; Kurez VOX White Pigmented.
- g. Kaufman Products, Inc.; Thinfilm 450.
- h. Lambert Corporation; AQUA KURE WHITE.
- i. L&M Construction Chemicals, Inc.; L&M CURE R-2.
- j. Meadows, W. R., Inc.; 1100-WHITE SERIES.
- k. SpecChem, LLC; PaveCure Rez White.
- I. Symons by Dayton Superior; Resi-Chem White.
- m. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

### 2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork] in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
  - Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
  - 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. ChemMasters; Exposee.
    - b. Conspec by Dayton Superior; Delay S.
    - c. Dayton Superior Corporation; Sure Etch (J-73).
    - d. Edoco by Dayton Superior; True Etch Surface Retarder.
    - e. Euclid Chemical Company (The), an RPM company; Surface Retarder Formula S.
    - f. Kaufman Products, Inc.; Expose.
    - g. Meadows, W. R., Inc.; TOP-STOP.
    - h. Metalcrete Industries; Surftard.
    - i. Nox-Crete Products Group; CRETE-NOX TA.
    - j. Scofield, L. M. Company; LITHOTEX Top Surface Retarder.
    - k. Sika Corporation, Inc.; Rugasol-S.
    - I. SpecChem, LLC; Spec Etch.
    - m. TK Products, Division of Sierra Corporation; TK-6000 Concrete Surface Retarder.
    - n. Unitex; TOP-ETCH Surface Retarder.
    - o. Vexcon Chemicals Inc.; Certi-Vex Envioset.
- F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

- 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. Anti-Hydro International, Inc.; A-H S-Q Hardener.
  - b. BASF Construction Chemicals, LLC; Mastercron.
  - c. ChemMasters; ConColor.
  - d. Conspec by Dayton Superior; Conshake 600 Colortone.
  - e. Dayton Superior Corporation; Quartz Tuff.
  - f. Euclid Chemical Company (The), an RPM company; Surflex.
  - g. Lambert Corporation; COLORHARD.
  - h. L&M Construction Chemicals, Inc.; QUARTZPLATE FF.
  - i. Metalcrete Industries: Floor Quartz.
  - j. Scofield, L. M. Company; LITHOCHROME Color Hardener.
  - k. Southern Color N.A., Inc.; Mosaics Color Hardener.
  - I. Stampcrete International, Ltd.; Color Hardener.
  - m. Symons by Dayton Superior; Hard Top.
- 2. Color: Match Architect's sample.
- G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

## 2.7 DETECTABLE WARNING MATERIALS

- A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
  - 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. Advanced Surfaces Inc.
    - b. Matcrete Precision Stamped Concrete Tools.
    - c. Southern Color N.A., Inc.
    - d. Stampcrete International Ltd.
    - e. Superior Decorative by Dayton Superior.
  - 2. Size of Stamp: One piece matching detectable warning area shown on Drawings
- B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.
  - 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. Advanced Surfaces Inc.; Liquid Release.
    - b. Matcrete Precision Stamped Concrete Tools; Liquid Release Agent.
    - c. Southern Color N.A., Inc.; SCC Clear Liquid Release.
    - d. Stampcrete International Ltd.; Stampcrete Liquid Release.
    - e. Superior Decorative by Dayton Superior; Pro Liquid Release.

### 2.8 PAVEMENT MARKINGS

- 1. Pavement-Marking Paint: Comply with A.L.D.O.T. Section 856
- B. Glass Beads: Per A.L.D.O.T. Specifications.

## 2.9 WHEEL STOPS

Section Omitted

#### 2.10 PREFORMED TRAFFIC-CALMING DEVICES

Section Omitted

## 2.11 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
  - 3. Slump Limit: 4 inches or less.
- C. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture or plasticizing and retarding admixture in concrete as required for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

## **PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

## 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

- 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - Locate expansion joints at intervals of 12 feet unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
    - Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    - Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
  - 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

## 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
  - Compact subbase and prepare subgrade of sufficient width to prevent displacement of slipform paving machine during operations.
- L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, steel reinforcement and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

## 3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
  - Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  - 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  - 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
  - Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
  - Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  - 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
  - Uniformly spread of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
  - 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
  - 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
  - 4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Rock-Salt Finish: After initial brooming, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft..
  - 1. Embed rock salt into plastic concrete with roller or magnesium float.
  - 2. Cover paving surface with 1-mil- thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
  - 3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.

- E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paying surface according to manufacturer's written instructions and as follows:
  - 1. Uniformly spread dry-shake hardener at a rate determined by the manufacturer.
  - 2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
  - 3. After final power floating, apply a hand-trowel finish followed by a broom finish.
  - 4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

# 3.9 DETECTABLE WARNINGS

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in construction drawings.
  - 1. Tolerance for Opening Size: Plus 1/4 inch, no minus.
- B. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
  - 1. Before using stamp mats, verify that the vent holes are unobstructed.
  - 2. Apply liquid release agent to the concrete surface and the stamp mat.
  - 3. Stamping: While initially finished concrete is plastic or after application and final floating of pigmented mineral dry-shake hardener, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
  - 4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
  - 5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

### 3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

# 3.11 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 3/4 inch.
  - 2. Thickness: Plus 3/8 inch. minus 1/4 inch.
  - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch.
  - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
  - 5. Lateral Alignment and Spacing of Dowels: 1 inch.
  - 6. Vertical Alignment of Dowels: 1/4 inch.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
  - 8. Joint Spacing: 3 inches.
  - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 10. Joint Width: Plus 1/8 inch, no minus.

### 3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
  - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal...

### 3.13 WHEEL STOPS

Section Omitted

# 3.14 PREFORMED TRAFFIC-CALMING DEVICES

Section Omitted

# 3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

- 1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
- 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
- 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
- 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
- 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

# 3.16 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

# **END OF SECTION**

# **SECTION 32 13 73**

# **CONCRETE PAVING JOINT SEALANTS**

#### **PART 1 - GENERAL**

### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section Includes:
  - 1. Cold-applied joint sealants.
  - 2. Cold-applied, jet-fuel-resistant joint sealants. (Omitted)
  - 3. Hot-applied joint sealants.
  - 4. Hot-applied, jet-fuel-resistant joint sealants. (Omitted)

# B. Related Sections:

- 1. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
- Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

# 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint sealants.
  - 1. Use manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit no fewer than eight (8) pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

# 1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Pavement-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

# 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.
- D. Preconstruction Compatibility and Adhesion Test Reports: From joint-sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility with and adhesion to joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Preinstallation Conference: Conduct conference at Project site or approved location.

### 1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

### **PART 2 - PRODUCTS**

# 2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

# 2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
  - 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. Crafco Inc., an ERGON company; RoadSaver Silicone.
- b. Dow Corning Corporation; 888.
- c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
  - I. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
    - b. Dow Corning Corporation; 890-SL.
    - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.
  - Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - Pecora Corporation; Urexpan NR-200.

# 2.3 COLD-APPLIED, JET-FUEL-RESISTANT JOINT SEALANTS

Section Omitted

### 2.4 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.
  - 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. Crafco Inc., an ERGON company; Superseal 444/777.
- B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I. II. and III.
  - Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Meadows, W. R., Inc.
    - b. Right Pointe; D-3405 Hot Applied Sealant.

# 2.5 HOT-APPLIED, JET-FUEL-RESISTANT JOINT SEALANTS

Section Omitted

# 2.6 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

# 2.7 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

# **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

# 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place joint sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
  - 1. Remove excess joint sealant from surfaces adjacent to joints.

- Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

# 3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

#### 3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within cement concrete pavement
  - Joint Location:
    - a. Expansion and isolation joints in cast-in-place concrete pavement.
    - b. Contraction joints in cast-in-place concrete slabs.
    - c. Other joints as indicated.
  - 2. Silicone Joint Sealant for Concrete: Single component, nonsag.
  - 3. Urethane Joint Sealant for Concrete.
  - 4. Hot-Applied Joint Sealant for Concrete: Single component.
  - 5. Joint-Sealant Color: Match Architect's sample.
- B. Joint-Sealant Application: Fuel-resistant joints within cement concrete pavement.

Section Omitted

- C. Joint-Sealant Application: Joints between cement concrete and asphalt pavement.
  - Joint Location:
    - a. Joints between concrete and asphalt pavement.
    - b. Joints between concrete curbs and asphalt pavement.
    - c. Other joints as indicated.
  - 2. Hot-Applied Joint Sealant for Concrete and Asphalt: Single component.
  - 3. Joint-Sealant Color: Match Architect's sample
- D. Joint-Sealant Application: Fuel-resistant joints between cement concrete and tar-concrete pavement[ .

Section Omitted

# **END OF SECTION**

# SECTION 32 92 19 SEEDING AND MULCHING

### **PART 1. GENERAL**

# 1.01 DESCRIPTION

A This section covers the work required for ground preparation, fertilizing, seeding, placement of mulching and establishing an acceptable growth of grass from seeds from the designated mixes shown.

# **PART 2. SUMMARY**

# 2.01 MATERIALS

A. Seed mixes shall be mixtures of the types of seeds shown in the following tables. The required weight shown in the chart is the actual seed weight as delivered and takes into account the minimum required percentage of pure seeds and minimum required germination rates.:

ZONE 1 - AREAS SUBJECT TO FREQUENT MOWING REQUIRED POUNDS PER ACRE OF PURE LIVE SEED							
Date of Planting	Aug. 16 to Feb. 29		Mar. 1 to May 15	May 16 to August 15			
Annual Ryegrass	10	25					
Hulled Bermudagrass			18	24			
Unhulled Bermudagrass	30		12				
Annual Lespedeza (Kobe)				38			
White Dutch Clover	5		6				
Notes	1	2					
Required Permanent Plant	Bermudagrass						

- 1. During this season Ryegrass, Bermudagrass and Clover are required where vegetation must be established within an area no further than 15 feet {3 m} from the edge of mainline pavement. (This is usually required for short duration work that is done on pavement resurfacing projects.)
- 2. Annual Ryegrass is required where vegetation must be established within an area that extends further than 15 feet {3 m} from the edge of mainline pavement. Seeding in stubble for the establishment of permanent vegetation is required during the following month of March.

Fertilizer shall be standard commercial products and shall contain not less than the percentage by weight of the ingredients set out in the following table.

TYPE		SPHORUS P 0	
13-13-13	13	13	13
8-8-8	8	8	8
Ammonium Nitr	ate33.5		
Nitrate of Soda	16.0		

- B. An allowance of 5 percent variation or tolerance of the above proportions will be permitted based on relative commercial value.
- C. All fertilizers shall be transported in containers which will insure proper protection, handling and which are commonly used with such fertilizers.
- D. All limestone for agricultural liming purposes shall be crushed or ground to such a degree of fineness that 90 percent of the material will pass through a 10 mesh screen and not less than 50 percent of the material will pass through a 60 mesh screen. All such limestone shall also have a neutralizing value of 90 percent calcium carbonate or better.
- E. Mulching materials shall conform to the requirements of Section 860 of the "A.L.D.O.T. Standard Specifications For Highway Construction, 2008 Edition.

### 3.01 CONSTRUCTION REQUIREMENTS

- A. Ground Preparation:
- B. Ground preparation shall, in general, consist of plowing, discing and harrowing of the areas to receive a ground cover in accordance with other Sections of these Specifications.
- C. Fertilizers shall include the furnishing and incorporating into the soil to the depth of preparation specified.
- D. The cost of water necessary for ground preparation, planting and establishment of an early stand of all erosion control items and the maintenance of these items for the duration of the contract shall be included in the unit price bid for the respective item of work involved.
- E. All equipment necessary for properly handling, storing, placing and incorporating the fertilizer into the prepared ground and for ground preparation shall be at hand, proved to be in good condition and available when required, and shall have been approved before work will be permitted to begin.
- F. Ground preparation shall consist of cultivation to loose depth of approximately four (4) inches (minimum) except on slopes steeper than 2.5 to 1, where depth shall be at least two (2) inches. The plowing, harrowing, cultivating and all other operations shall be performed with property equipment and in such a manner as to break up all clods, lumps or earth balls, and remove all boulders, stumps, large roots, and other particles which will interfere with the work which will result in a smooth, uniform, loose, well broken and fine grained soil; thus providing a suitable

SEEDING AND MULCHING

bed for seed grass and plants. The ground shall be plowed to the required depth then cultivated with a rotary tiller and/or disc harrow, in both directions if feasible, until approved. After removal of all large particles which cannot be broken, the surface shall then be harrowed and tilled. The Contractor shall add sufficient water to wet the soil in order to prepare the ground.

G. Fertilizers shall be applied uniformly into the areas to be planted or improved in such amount and to such depth and according to the methods indicated in the Specifications for the various ground covers. The fertilizer shall be well pulverized and free of lumps when applied. In no case shall full strength fertilizer be permitted in direct contact with roots. When fertilizers are applied hydraulically they must be diluted sufficiently as directed so that no damage is done to either seed or established grasses and legumes. Agricultural limestone and basic slag shall be applied separately but may be incorporated in the soil with fertilizers in one operation.

# H. Seeding:

- 1. Seeding operations shall be performed as provided hereinafter in these Specifications or as shown on the plans so that the various seed species noted for the seed mixture designated for use are sown during the proper sowing dates specified for the seed involved.
- 2. When during any part of the specified sowing season, weather or ground conditions are such that satisfactory results are not likely to be obtained, the Engineer will not permit the work to proceed.
- 3. The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of the time he intends to start inoculating and mixing seed or begin sowing seed and shall not proceed with such work until permission to do so has been given.
- 4. All ground preparation, incorporation of fertilizer, inoculation of seed, seed mixing and other work preparatory to planting as well as the operation of sowing, covering, and rolling shall be done in the presence of the Inspector.
- 5. Fertilizer shall be applied mechanically or, if so authorized in writing by the Engineer, applied by approved hydraulic equipment. Fertilizer and agricultural limestone or basic slag shall be applied separately but may be incorporated together. The seed bed for all mixed seedings shall be fertilized initially with two (2) tons of agricultural limestone, or basic slag when permitted, and 1500 pounds of grade 8-8-8 fertilizer per acre or a sufficient quantity of any other acceptable grade of commercial fertilizer that will provide at least 120 pounds of nitrogen, 120 pounds of available phosphoric acid and 120 pounds of total potash per acre, as computed from the nominal contents of fertilizing ingredients. After the grass has shown growth (usually approximately 40 days) and while the soil surface is moist a second application of fertilizer shall be made as a top dressing of nitrate of soda, sulfate of ammonia, ammonium nitrate or other approved high nitrate fertilizer used at a rate to provide at least 67 pounds of nitrogen per acre, for example, approximately 200 pounds of 33.5% ammonium nitrate.
- 6. Preparatory to sowing, the seed accepted for use shall be inoculated as provided herein. Each kind of seed shall be inoculated separately with the appropriate commercial culture according to instructions of the manufacturer of the material accepted for use, then allowed to surface dry to a free flowing state before mixing or sowing. In general, no greater quantity of seed shall be inoculated at one time than can be sowed by the end of the following day. All inoculated seed shall be protected from the sun and direct contact with commercial fertilizers.
- 7. Following inoculation, seed of approximately the same size may be mixed together. Just prior to planting, all seed to be sown together shall be mixed by approved means until uniform in detail.
- 8. Sowing of seed shall, in general, follow promptly after incorporation of fertilizer in a uniform manner at the rates specified for each seed specie.

- 9. Sowing shall be done by approved mechanical seeders. Without prejudice to power equipment or seeders of other types and makes, hand operated cyclone sowers, in sufficient number, will be considered mechanical seeders. No sowing shall be done during windy weather, when the prepared surface is crusted, or when the ground is frozen, wet or otherwise in a non-tillable condition.
- 10. Care shall be exercised during covering operation to preserve the line, grade and cross-section of the seeded areas and to see that areas adjacent to pavement, walks, etc. are not higher than the paved surface. Unless otherwise directed after the seed has been sown the seed bed shall be compacted immediately by means of a cultipacker, light roller or approved drag. The weight of the roller or drag needed will be determined by the Engineer according to the type and physical condition of the soil involved. Rolling or covering of seed may be omitted when seeding is done hydraulically and mulched.
- 11. The Contractor shall water, fill washes, and otherwise protect and maintain the seeded areas until the contract is accepted or grassing bond is released.
- 12. Damage by either pedestrian, vehicular traffic, or other causes shall be repaired by the Contractor. It shall be the responsibility of the Contractor to establish and maintain a satisfactory stand of grass until final acceptance of the project.
- 13. The acceptance of designated seeded areas will be based on verification of a satisfactory stand of grass and legumes in the season of each seed specie required by the mix designated for use. If a satisfactory stand of grass is not established, the areas shall be re-seeded without additional cost.
- 14.A satisfactory stand is defined as a cover of living plants, after true leaves are formed, of the seed species required by the mix designated for use in which gaps larger than five (5) inches square do not occur.

**END OF SECTION** 

# SECTION 33 41 00 SITE STORM UTILITY DRAINAGE PIPING

#### **PART 1 - GENERAL**

# 1.01 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Channel drainage systems.
  - 3. Encasement for piping.
  - 4. Manholes.
  - 5. Cleanouts.
  - 6. Nonpressure transition couplings.
  - 7. Expansion joints.
  - 8. Catch basins.
  - 9. Stormwater inlets.
  - 10. Pipe outlets.

### 1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
  - 2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 10 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- F. Field quality-control reports.

# 1.03 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.

# **PART 2 - PRODUCTS**

### 2.01 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
  - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
  - 2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
  - 2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

# 2.02 PVC PIPE AND FITTINGS

- A. PVC Corrugated Sewer Piping:
  - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
  - 3. Gaskets: ASTM F 477, elastomeric seals.

### 2.03 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
  - 1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443, rubber gaskets
  - 2. Class III, Wall A or Wall B.
  - 3. Class IV, Wall A or Wall B.

### 2.04 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
  - 1. For Concrete Pipes: ASTM C 443, rubber.
  - 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
  - 1. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:

 Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosionresistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

# E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

### 2.05 EXPANSION JOINTS

- A. Ductile-Iron Flexible Expansion Joints:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. EBAA Iron Sales, Inc.
    - b. Romac Industries, Inc.
    - c. Star Pipe Products.
  - Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

# 2.06 CLEANOUTS

### A. Cast-Iron Cleanouts:

- 1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
- 2. Top-Loading Classification(s): Heavy Duty.
- 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

# B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

# 2.07 MANHOLES

### A. Standard Precast Concrete Manholes:

- 1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
- 2. Diameter: 48 inches minimum unless otherwise indicated.
- 3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
- 4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
- 5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
- 6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.

- 7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
- 8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
- 9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
- Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
- 11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

### B. Manhole Frames and Covers:

- 1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
- 2. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

### 2.08 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
  - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
  - Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    - a. Invert Slope: 1 percent through manhole.
  - 2. Benches: Concrete, sloped to drain into channel.
    - a. Slope: 4 percent.

- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
  - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

### 2.09 CATCH BASINS

- A. Standard Precast Concrete Catch Basins:
  - 1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
  - 3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
  - 4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  - 6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  - 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
  - 8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 inches.
  - 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
  - 1. Size: 24 by 24 inches minimum unless otherwise indicated.
  - 2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
  - 1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

# 2.10 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening of materials and dimensions according to city standards.
- B. Gutter Inlets: Made with horizontal gutter opening of materials and dimensions according to city standards. Include heavy-duty frames and grates.

- C. Combination Inlets: Made with vertical curb and horizontal gutter openings of materials and dimensions according to county standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty according to county standards.

# 2.11 PIPE OUTLETS

- A. Head Walls: Slope paved concrete.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
  - 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
  - 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
  - 3. Average Size: NSSGA No. R-5, screen opening 5 inches.
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

### **PART 3 - EXECUTION**

### 3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### 3.02 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 3. Install piping with 24-inch minimum cover.
  - 4. Install PE corrugated sewer piping according to ASTM D 2321.
  - 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

6. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

### 3.03 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
  - 2. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
  - 3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  - 4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

# 3.04 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic.
  - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
  - 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
  - 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

# 3.05 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 6 inches above finished surface elsewhere unless otherwise indicated.

### 3.06 CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

# 3.07 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

### 3.08 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

# 3.09 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 6-inch minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.
- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 6-inch minimum concrete around bottom and sides.

### 3.10 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
  - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

- D. Pipe couplings and expansion joints with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
  - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
    - a. Shielded flexible couplings for same or minor difference OD pipes.
    - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

# 3.11 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  - 1. Use detectable warning tape over ferrous piping.
  - Use detectable warning tape over nonferrous piping and over edges of underground structures.

# 3.12 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
- b. Option: Test plastic piping according to ASTM F 1417.
- c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

# **END OF SECTION**